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A journal of plant ecology for eastern Australia

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National Herbarium of New South Wales

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COVER

Lowland Gully Shrub Forest (Map Unit 37 — see p.143) at Saltwater Creek, near Eden.

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ISSN 0727–9620

National Herbarium of New South Wales
Royal Botanic Gardens Sydney
Mrs Macquaries Road
Sydney NSW Australia 2000

Native vegetation of the South East Forests region, Eden, New South Wales

David A. Keith and Michael Bedward

Abstract

Keith, David A. and Bedward, Michael, (NSW National Parks and Wildlife Service, PO Box 1967, Hurstville NSW Australia 2220) 1999. Native vegetation of the South East Forests region, Eden New South Wales. Cunninghamia *6(1): 001–218.* Terrestrial, freshwater and estuarine native vegetation of the Eden region was classified into 79 floristic assemblages and mapped at 1: 100 000 scale. Assemblages were derived from multivariate analysis of 1604 quantitative vegetation samples. Mapping was carried out using a hybrid decision tree-expert system approach based on quantitative relationships between floristic assemblages and spatial variables (land cover pattern, substrate, climatic variables and terrain variables) and qualitative expert knowledge derived from field experience. The use of vegetation-environment relationships and sampling of remnants allowed prediction of vegetation patterns prior to European clearing. The map was validated using three procedures: qualitative checking by experts; reliability mapping using sampling intensity; and accuracy quantification using independent sample data. The map units were described using comprehensive profiles of diagnostic species, structural features, habitat characteristics and sample distributions.

The 79 floristic assemblages include rainforests, mesic eucalypt forests, dry grassy eucalypt forests of the coastal rainshadow valleys, hinterland and tableland, dry shrubby eucalypt forests, grasslands, heathlands, scrubs and wetlands. Variation in climate and geological substrate influence vegetation patterns at regional scales, while variation in topography, local soil moisture and nutrient status and disturbance regimes influence vegetation patterns at local scales. Sixty-eight per cent of the region retained a cover of native vegetation in 1994. Processes threatening various portions of the remainder include further habitat loss from clearing, high-frequency disturbances and certain other disturbance regimes, overgrazing, habitat degradation due to nutrification, dumping and vandalism, and feral animal activity. Past depletion of habitat has been highly biased. Some grassy assemblages on fertile flat terrain are depleted by more than 90%, while some forests with shrubby understories in steep infertile terrain retain close to their original extent. The former assemblages are distributed principally as remnants on privately owned land, while the latter occur in remote areas of public land. Representation in conservation reserves is also biased against grassy assemblages in fertile flat terrain, as well as some other assemblages with restricted distributions. Opportunities for conservation of these assemblages are now very limited and rely on integrated planning, reservation and cooperative management with emphasis on private land.

For Tommy Keith (1918–1999). Best friend.

Introduction

In far south-eastern New South Wales coastal wilderness and rugged forested mountains are juxtaposed with undulating pastoral country in coastal valleys and subalpine plains. The region falls centrally within Australia's unique temperate eucalypt forest biome (Beadle 1981, Ovington 1983).

Ferdinand von Mueller, director of the National Herbarium of Victoria, was one of the earliest botanical explorers of the South East Forests in 1860. Mueller's ventures to Twofold Bay and the upper Genoa River were preceded by earlier expeditions to the Monaro Tableland by Cunningham and Lhotsky (Benson 1994, Andrews 1998). Knowledge of the regional flora developed opportunistically over a century with numerous collecting trips by botanists based in Sydney and Melbourne and, more recently, Canberra. With the development of nature conservation as a land use, a number of vegetation surveys were carried out to provide resource inventories for reserve management (Breckwoldt 1979, Gilmour 1983, Outhred 1986, Lane et al. 1998) and management of National Estate values within production forest (Fanning & Rice 1989, Fanning & Mills 1989, 1990, 1991, Fanning & Fatchen 1990, Binns & Kavanagh 1990a, b, Fanning & Clark 1991). Hitherto neglected remnant vegetation within fragmented, largely freehold agricultural landscapes of the Bega valley and associated areas was surveyed by Keith (1995) and Miles & Stone (unpubl.), while targeted surveys addressed specialised habitats including rainforest (Floyd 1982), coastal sand dunes (Clarke 1989) and saltmarsh (Clarke unpubl.).

Vegetation maps derived from aerial photograph interpretation and field reconnaissance were produced for some of the areas addressed by local surveys (e.g. Breckwoldt 1979, Gilmour 1983). Mapping of forest types (Baur 1989) was also carried out in selected areas of production forest (State Forests of NSW, unpublished maps). Vegetation surveys and small-scale vegetation maps are available for East Gippsland to the south (Forbes et al. 1982, Parkes et al. 1984, Woodgate et al. 1994), areas further north on the NSW south coast (Austin & Sheaffe 1976, Austin 1978, CSIRO 1996) and the Monaro Tableland to the west (Costin 1954).

Formation of a regional overview of the biota became an important goal with the need for environmental impact assessment of woodchipping operations (Harris-Daishowa 1986, Forestry Commission of NSW 1988) and increasing emphasis on the representativeness of regional reserve systems (Austin & Margules 1986). This began with compilation of a preliminary species list for the region (Binns 1987) and a quantitative synthesis of regional vegetation patterns (Keith & Sanders 1990). In the absence of detailed vegetation mapping across the region, surrogate maps based on modelled forest types (Skidmore 1989, Forestry Commission of NSW 1988), land systems (Keith & Sanders 1990) and environmental domains (Richards et al. 1990) were developed to provide a basis for environmental impact assessment and regional land use decisions.

A formal framework for resolving potential conflicts between competing land uses was adopted through the endorsement of Australia's National Forest Policy Statement (Commonwealth of Australia 1992). The policy provides for Regional Forest

Agreements (RFAs) between Commonwealth and State governments that will address planning and management for both a comprehensive, adequate and representative system of conservation reserves and ecologically sustainable use of forest resources (Anon. 1998). The agreements are to be negotiated using the outcomes of comprehensive regional assessments of environmental, heritage, economic and social values of the forests. A detailed regional map representing the distributions of plant and animal habitats is an essential requisite for the assessment of environmental and heritage values. Guidelines for the assessment suggest that map units, termed 'forest ecosystems' should preferably 'be discriminated at a resolution requiring a map-standard scale of 1:100 000... [and] defined in terms of floristic composition in combination with substrate and position within the landscape' (JANIS 1996).

The purpose of this study was to develop a regional land classification and map that effectively represents species distributions. Consistent with JANIS (1996), we adopted an approach based on floristic composition and its relationship with environmental variables. Although initially intended to provide the central component of an information base on biodiversity for the Eden Comprehensive Regional Assessment, classification and mapping were carried out mindful of previous work and broader needs in environmental planning, assessment and management beyond the Eden Regional Forest Agreement. The work presented here is the fourth revision (version 4.0) of a vegetation survey and map that has previously been available in published and unpublished forms (Keith & Sanders 1990, Keith et al. 1995, Keith & Bedward 1998). Revisions to the map since version 3.0 (Keith & Bedward 1998), which was used in the Eden Comprehensive Regional Assessment, relate primarily to areas of privately owned land and some rainforest and scrub assemblages.

Study Area

The study area coincides with the Eden Native Forest Management Area (State Forests of NSW 1994) in the south-eastern corner of New South Wales between Bermagui and Numeralla in the north and Cape Howe and Craigie in the south (Fig. 1). The area comprises 800 000 ha between latitudes 36°22' and 37°30'S and longitudes 149°00' and 150°05'E and is bounded by the Tasman Sea to the east, the Victorian border to the south, the Monaro Tableland to the west and an arbitrary line following watercourses, roads and landforms in the north. The Bega and Towamba Rivers and their tributaries respectively drain most of the region to the east, while the Genoa and Wallagaraugh Rivers run to the south, the Bombala and McLaughlin Rivers run to the south-west and the Numeralla and Kybean Rivers run north-west into the Murray River basin.

Landscape

Keith and Sanders (1990) described broad geomorphological and vegetation patterns in the region using land systems. A narrow coastal plain dominated by sand and gravel deposits of Tertiary and Holocene age supports heath, scrub and dry forest vegetation punctuated by coastal lagoons, estuaries and swamps. A low and broken coastal range rises to about 300 m elevation, although this height is well exceeded by individual mountains including Mumbulla Mountain (775 m), Burragate Peak (879 m),

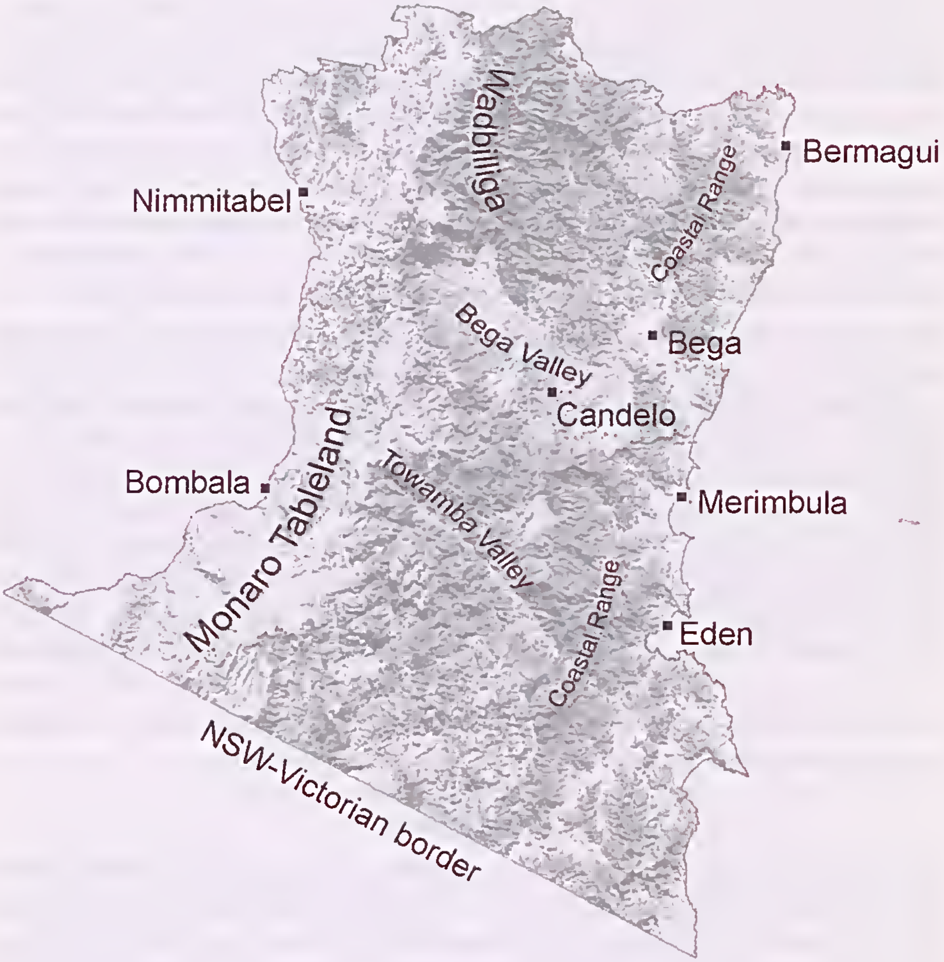

Fig. 1. South East Forests study area based on the Eden Forest Management Area.

Mt Imlay (888 m) and Mt Nadgee (542 m). The coastal range is comprised mainly of Ordovician and Devonian siltstones and sandstones subject to varying degrees of metamorphism. Devonian granitoid intrusions outcrop at Mumbulla Mountain (tonalite) in the north and around Mt Nadgee (adamellite) in the south, while an alkali intrusion of monzonite and related rock types outcrops on Burragate Peak (Beams & Hough 1984). Localised outcrops of Devonian rhyolite and basalt occur around Nethercote, west of Pambula. The coastal range is dominated by dry shrubby eucalypt forests with mesic eucalypt forests and numerous small patches of rainforest in sheltered gullies.

Further west, the coastal range gives way to an undulating hinterland dominated by the Bega Batholith, a complex of Devonian acid volcanics including mainly adamellite and granadiorite with smaller outcrops of granite, quartz diorite, leucogranite, tonalite and gabbro (Beams & Hough 1984). Small outcrops of Ordovician metamorphosed mudstones occur throughout. The rainshadow valleys of the Bega and Towamba Rivers and Narira Creek are a feature of the hinterland. Dry grassy eucalypt forests dominate these valleys, while forests of the remaining hinterland (e.g. in the Wallagaraugh catchment) have a greater but variable shrub component (Keith & Sanders 1990).

The western parts of the rainshadow valleys are bounded by a steep granitoid escarpment that exceeds 900 m elevation at its highest point west of Bemboka. The dry lower slopes support grassy eucalypt forest, while sheltered gullies and elevated slopes receiving orographic moisture support mesic eucalypt forest and small patches of rainforest. The escarpment rises to a mountain range, generally 700–1000 m elevation, on the edge of the tableland. This range joins the Great Dividing Range east of Nimmitabel in the north and exceeds 1200 m elevation still further north at Kydra. The tableland range is dominated by granitoid geology with localised outcrops of Ordovician metamorphosed mudstones (e.g. on Wog Wog Mountain) and Tertiary basalt at Mt Darragh, Bull Mountain and Brown Mountain. Mesic eucalypt forests are the principal vegetation cover, with dry shrubby eucalypt forests occurring on more exposed slopes and ridgetops. The tableland range dissipates in the south where several isolated mountains and plateaux punctuate the terrain. These include Nalbaugh Plateau-Wog Wog Mountain, Letts Mountain, Mt Poole, Mt Waalimma, Mt Tennyson and Nungatta and Yambulla Mountains. The latter peaks form part of a dissected Devonian sandstone plateau dominated by dry shrubby eucalypt forest.

North of the Bega valley, the tableland range adjoins an extensive area of highly dissected terrain derived from Devonian metamorphosed siltstones and sandstones. This landscape is dominated by dry shrubby eucalypt forest with mesic eucalypt forest and small patches of rainforest confined to the most sheltered gorges, and heath atop the most exposed high-elevation ridges.

In the west, the tableland range declines and adjoins an extensive elevated plain, the Monaro Tableland. An extensive belt of Tertiary basalt extends along the western boundary of the study area north from Bombala. Metamorphosed siltstones, mainly of Ordovician age but some of Silurian and Devonian age, cover much of the remaining area, with some areas of Devonian granitoid rocks. Volcanic substrates support grassy eucalypt woodlands with grassland on large low-lying areas of basalt, while metamorphosed sediments support eucalypt woodlands with a mixed grass and shrub understorey. Exposed hills close to the tableland range support localised patches of heath, while bogs form on poorly drained flats.

Climate

Mean annual precipitation varies from 800–900 m on the coastal strip and generally increases orographically inland to the summits of the coastal ranges. Precipitation exceeds 1000 mm on the tableland range and is likely to exceed 1300 mm on mountain summits such as Mt Imlay and Wog Wog Mountain. Rainshadow effects prevail in the Bega and Towamba valleys where mean annual precipitation falls below 700 mm. The Monaro Tableland is also in a rainshadow zone where the driest parts of the region near Numeralla and Bombala receive less than 600 mm annual precipitation. Preciptation is weakly seasonal in the region with late summer months likely to be wetter than late winter months.

On the coast mean daily maximum temperatures reach 25°C in February on the coast at Merimbula, while mean daily minima are 4°C in July (Commonwealth of Australia 1988). Temperature ranges increase further inland, with equivalent means for Bega being 27° and 1°C, respectively, and frost occurs on average 30 days per year. The tablelands are generally cooler all year round, Nimmitabel having a daily maximum temperature of 23°C in February and a mean daily minimum of -2°C and nearly 100 frost days (Commonwealth of Australia 1988).

Land use and management

Numerous archaeological sites within the region suggest aboriginal occupation in the region over some tens of thousands of years (e.g. Byrne 1983). Aboriginal people interacted with their environment through hunting, gathering and burning, although the extent and ways in which they influenced fire regimes are subject to speculation and debate (Benson & Redpath 1997).

European settlement began in the region in the late 1820s as squatters occupied land for grazing in the Bega and Towamba valleys (Codrington 1979, Byrne 1983, Andrews 1998) and on the Monaro Tableland (Benson 1994, Andrews 1998). By the time of Lambie's census in 1839, a population of more than 100 pastoralists and their workers and families had become established both on the coast and on the tableland (Andrews 1998). The environmental impact of pastoralism was initially slow, although native forest was cleared in localised patches within large grazing runs, and localised erosion and introduced species were recorded as early as 1830 (Lunney & Leary 1988). Agricultural land uses intensified after 1860 with conversion to freehold title and growth of the dairy industry in coastal valleys. By the first decade of the twentieth century most of the native vegetation in the Bega valley had been cleared. Clearing of the small remaining patches of native vegetation in the coastal valleys and on the tableland continued at a slow rate to the present day (Lunney & Leary 1988, Keith 1995), with a total of 32 per cent (c. 260 000 ha) of the region being cleared by 1994 (analysis of Landsat TM image).

Pastoral activities vary across the region. Intensive dairying is limited to the more productive lower parts of the Bega valley, beef cattle grazing predominates in other freehold parts of the Bega and Towamba valleys, as well as on small crown and State Forest leases scattered across the hinterland and tableland, while sheep grazing is the dominant pastoral activity on the Monaro Tableland.

In contrast to the coastal valleys and the tableland, the surrounding 'hill country' has retained a greater extent of its native vegetation cover and remains largely in public ownership. There are about 400 000 ha of naturally vegetated public land, accounting for about half of the region. Hardwood (eucalypt) forestry is a major industry in this part of region, although sawn timber production commenced initially in the Bega valley in tandem with land clearance for agriculture (Lunney & Leary 1988). Sleeper cutting accounted for a large part of timber production from 1900 until after World War II when demand for building materials increased and made sawlog extraction more economically viable (Lunney & Leary 1988).

Selective logging continued in the most accessible parts of the region until the development of a pulpwood industry in 1969. The new industry resulted in a significant change in forest management with the introduction of integrated logging (SFNSW 1994). Under this system a high proportion of standing biomass is removed for both sawlogs and pulpwood in alternate coupes (10–200 ha patches) across the production forest landscape on a rotation of 50–80 years. Thinning operations are carried out within the regrowth forest at intervals of two to four decades.

Development of a softwood sawlog industry based on plantations of *Pinus radiata* paralleled the development of the pulpwood industry. Some 35 000 ha of plantations were established over marginal grazing lands and native forest during the 1970s and 1980s, largely in the Bombala and Pericoe areas in the west and south, respectively.

Mineral extraction is a minor land use within the region. Goldfields at Yambulla, Pambula and Wolumla were mined last century and the first two of these are now recognised as cultural heritage sites. A small industry extracting pyrophyllite from rhyolite outcrops west of Pambula has operated in recent decades.

Nature conservation was established as a formal land use within the region with the dedication of Nadgee Nature Reserve in the far south east of the region in 1962. Additions to the reserve system in the late 1960s and 1970s focussed on mountainous wilderness areas. Further additions in 1990 and 1996 and the Eden Regional Forest Agreement (1998) reflected a change in emphasis toward balanced representation of different habitats in the region (Margules & Stein 1989, Bedward et al. 1992a). Conservation within reserves entails management of fire regimes, rare and threatened species, pest species and recreational visitors. Reserves are supplemented by increasing off-reserve conservation through management of production forests, community programs and voluntary agreements with private landholders, and planning regulations administered by state agencies and local government.

Tourism has grown rapidly within the last two decades and is focussed primarily on coastal locations, heritage sites and bushland. The development of tourism is reflected in the expansion of coastal townships, particularly Merimbula and Tathra and the intensified use of the coast for recreation.

Disturbance regimes

Eden's climate supports occasional high intensity forest fires, particularly in wetter parts of the region, while drier parts of the region may experience more frequent fires of lower intensity (Keith & Sanders 1990). Dendrochronological studies of fire scars (Banks 1990) and charcoal deposition patterns in peat profiles (Polach & Singh 1980) suggest possible changes in the fire regime with patterns of human occupation and land use. Some of these changes involve a general increase in fire frequency corresponding with European settlement (Banks 1990) and are consistent with inferences drawn elsewhere in eastern Australia (Benson & Redpath 1997). At two study sites in the upper Tantawangalo catchment, fire frequency increased in several episodes between 1830 and the early part of this century, then decreased after 1970. Overall average return times were 8 and 14 years, respectively, in dry and wet eucalypt forest sites (Banks 1990). Many of these fires are likely to have been low intensity events associated with native pasture management and timber-getting. Major fires were recorded within the region during 1988, 1983, 1980, 1972, 1968, 1964, 1954, 1952, 1939 and 1926 (SFNSW 1994). In these years, the estimated areas burnt varied between 10 000 and 80 000 ha, up to 10 per cent of the region (SFNSW 1994). Although such fires recur somewhere in the region every 2–13 years, the average return time of major wildfires is likely to be much longer than 20 years because successive fires did not always overlap, even allowing for small but intense events recorded in local parts of the region in other years (Lunney & Leary 1988, Banks 1990).

In recent years, intensive management systems in wood production forests include logging, regeneration fires and hazard reduction fires (SFNSW 1994). These disturbances are superimposed upon unplanned components of the fire regime and interact in potentially complex ways (Bradstock et al. 1995). Current management regimes in production forest includes low-intensity hazard reduction burning on a 4–7 year rotation and up to 3 years prior to logging. Logging and high-intensity regeneration burns are planned to be implemented every 50–80 years. All fires are excluded for c. 15 years after logging. Several thinning operations may be implemented at 20–40 year intervals in between intensive logging events. Integrated logging is also carried out within privately owned forests, though generally with fewer management controls.

Methods

Classification and mapping approach

Map units are widely recognised in conservation biology as potential 'surrogates' or 'coarse filters' for biodiversity (Austin & Margules 1986, Noss 1987). The use of floristic assemblages as biodiversity surrogates (JANIS 1996) is supported *a priori* by the fact that vascular flora accounts for a significant portion of the total biodiversity of a site and that plant species individually or collectively provide essential habitat resources for many other organisms. However, a range of empirical approaches suggest that the extent to which alternative map bases correctly predict species distributions remains uncertain (e.g. Burgman 1988, Bedward et al. 1992b, Pressey & Bedward 1991, Ferrier & Watson 1997, Oliver et al. 1998, Panzer & Swartz 1998). Some of these studies suggest that the predictive capability of maps may be quite poor in certain areas or for certain biotic groups (Ferrier & Watson 1997, Oliver et al. 1998). Nevertheless, there is some evidence that floristic assemblages are either better predictors of species distributions (e.g. Pressey & Bedward 1991, Ferrier & Watson 1997) or no worse than alternative classifications and maps (e.g. Burgman 1988, Ferrier & Watson 1997), even though the range of different map bases examined is limited.

Furthermore, some substantial methodological sampling issues remain to be overcome in empirical studies of map surrogacy (e.g. Ferrier & Watson 1997).

In this study we have developed a classification based on floristic composition using an approach illustrated in Fig. 2. We used quantitative analyses of field samples to interpret and classify compositional patterns and then carried out mapping as an independent step using environmental relationships and remote data (e.g. Keith 1994, Brooker & Margules 1996). This contrasts with traditional mapping approaches, which place primary emphasis on remote sensing for both the definition and mapping of vegetation classes (e.g. Keith & Benson 1988, Baur 1989, Sun et al. 1996). Quantitative field samples offer greater accuracy and precision in the measurement of floristic composition than remote data combined with qualitative field reconnaissance especially, though not only, for understorey species which account for more than 90 per cent of floristic diversity in this region. Quantitative samples also lend themselves to explicit multivariate analysis, which may detect patterns that escape recognition by traditional intuitive methods. Mapping was carried out using explicit decision rules to interpolate the distributions of floristic classes from point samples using relationships between the classes and environmental and remote structural variables that were available as spatial data layers (Fig. 2). The separation of mapping as an independent step based on explicit data-dependent decision rules maximises mapping consistency and reduces the role of non-repeatable intuitive classification and mapping decisions.

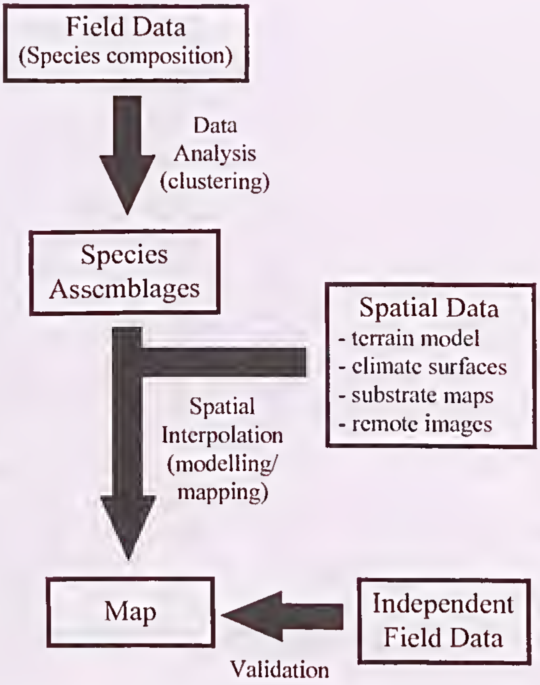

Fig. 2. Approach to vegetation classification and mapping based on field samples.

Vegetation data

Sample stratification

Sampling was stratified by parent material, elevation and terrain. The samples were gathered over a period from 1987 to 1997. Sample stratification was refined iteratively over this period with field sampling targeted to fill gaps. The progressive evaluation of sampling gaps also took into consideration suitable data available from other sources (see below). The final sample stratification was based on eight classes of parent material, seven classes of altitude, two classes of slope and three classes of aspect on steep slopes (Table 1). The distributions of sampling strata were mapped by intersection of relevant spatial data layers in a geographic information system (Eastman 1993). This was used in fieldwork planning and, in conjunction with a recent digital Landsat coverage, allowed the naturally vegetated extent of each stratum to be calculated. As expected, the distribution of strata in the study area was highly skewed with 100 of 224 possible strata not represented within the study area and only 17 of the remaining 124 strata accounting for more than 50% of the naturally vegetated area.

One hundred and two of the 124 sampling strata with extant vegetation were sampled (Table 1). The remaining unsampled strata represented environments covering less than 0.02% of native vegetation in the region, suggesting that sampling had a qualitative coverage of regional environmental variation. The most widespread strata were covered by larger numbers of samples (Table 1, Fig. 3).

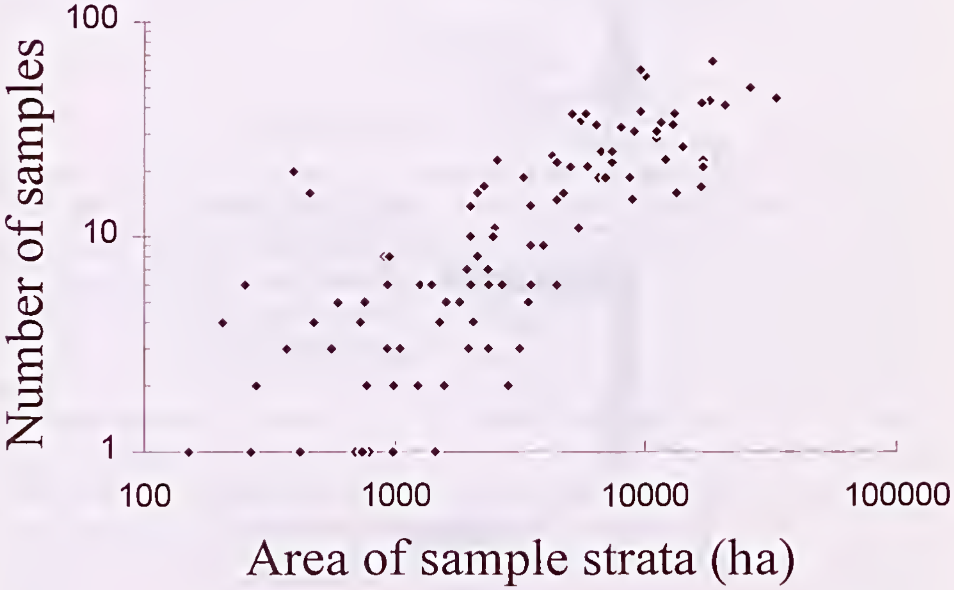

Fig. 3. Numbers of samples in sampling strata of varying extent (excluding cleared land).

Table 1. Sample stratification by classes of substrate, terrain and elevation. Data are number of samples and area (extant) under native vegetation (ha). Terrain classes: flat, slope ≤ 5°; north, slope > 5° and aspect < 30° or > 300°; intermediate, slope > 5° and aspect 30–120° or 210–300°; south, slope > 5° and aspect 120–210°. Elevation in metres above sea level.

Substrate/terrain	Elevation	0–150	151–300	301–450	451–600	601–750	751–900	> 900	Total
Riverine alluvium									
flat	#samples	14	-	2	-	-	-	1	17
	extant area	2002	0	279	0	0	0	87	2616
north	#samples	1	-	-	-	-	-	-	1
	extant area	776	0	0	0	0	0	0	855
intermediate	#samples	5	-	0	-	-	-	-	5
	extant area	1601	0	101	0	0	0	0	1913
south	#samples	1	-	-	-	-	-	-	1
	extant area	695	0	0	0	0	0	0	924
Coastal sand									
flat	#samples	25	-	-	-	-	-	-	25
	extant area	390	0	0	0	0	0	0	390
north	#samples	5	-	-	-	-	-	-	5
	extant area	202	0	0	0	0	0	0	202
intermediate	#samples	18	-	-	-	-	-	-	18
	extant area	454	0	0	0	0	0	0	454
south	#samples	7	-	-	-	-	-	-	7
	extant area	248	0	0	0	0	0	0	248
Tertiary alluvium									
flat	#samples	16	1	-	-	-	1	-	18
	extant area	13376	140	0	0	0	150	0	13864
north	#samples	0	0	-	-	-	-	-	0
	extant area	2045	33	0	0	0	0	0	2161
intermediate	#samples	9	-	-	-	-	-	-	9
	extant area	3894	0	0	0	0	0	0	4147
south	#samples	4	0	-	-	-	-	-	4
	extant area	2032	17	0	0	0	0	0	2091
Sedimentary (low quartz)									
flat	#samples	6	3	0	-	-	0	10	19
	extant area	1995	370	151	0	0	174	2461	5206
north	#samples	1	6	3	5	1	0	3	19
	extant area	974	928	925	759	739	821	2360	7506
intermediate	#samples	7	16	7	2	4	3	11	50
	extant area	2377	2105	1927	1570	1510	1970	5463	16923
south	#samples	2	8	8	2	0	0	8	28
	extant area	1219	901	937	760	767	909	2141	7633
Sedimentary (high quartz)									
flat	#samples	17	5	3	4	1	14	2	46
	extant area	16623	3427	1036	468	419	3438	982	26392
north	#samples	23	29	19	6	2	6	5	90
	extant area	17070	11071	6398	4403	2805	2646	1789	46183

Table 1. cont.

Substrate/terrain	Elevation	0–150	151–300	301–450	451–600	601–750	751–900	> 900	Total
intermediate	#samples	44	41	33	31	19	19	22	209
	extant area	33239	20982	12781	8942	6558	6961	4423	93886
south	#samples	21	23	25	16	9	6	10	110
	extant area	17074	11983	6704	4692	3464	3481	1982	49381
Rhyolite									
flat	#samples	6	0	-	-	-	-	-	6
	extant area	2363	73	0	0	0	0	0	2439
north	#samples	0	0	-	-	-	-	-	0
	extant area	1291	160	0	0	0	0	0	1452
intermediate	#samples	3	0	-	-	-	-	-	3
	extant area	3155	442	0	0	0	0	0	3598
south	#samples	1	0	-	-	-	-	-	1
	extant area	1440	142	0	0	0	0	0	1584
Granitoid volcanics									
flat	#samples	19	22	31	35	23	33	42	205
	extant area	3286	7397	11185	5523	2571	6357	16673	52992
north	#samples	11	19	34	32	24	15	21	156
	extant area	2521	8643	11613	7963	4292	4404	5869	45304
intermediate	#samples	21	43	49	66	55	59	26	319
	extant area	4982	18241	26008	18612	10007	9611	14232	101692
south	#samples	17	15	37	38	37	37	25	206
	extant area	2254	8841	13117	9572	5743	5092	7379	51997
Basalt									
flat	#samples	0	-	-	-	-	5	6	12
	extant area	112	0	0	0	0	587	1244	2040
north	#samples	0	0	-	-	-	0	3	3
	extant area	381	203	0	0	0	144	551	1321
intermediate	#samples	0	0	-	-	-	0	6	6
	extant area	420	453	0	0	0	534	1392	2932
south	#samples	0	0	-	-	-	2	4	6
	extant area	183	170	0	0	0	266	722	1438
Total #samples		**304**	**230**	**253**	**237**	**176**	**199**	**205**	**1604**
Total extant area		**140676**	**96866**	**93491**	**63460**	**39353**	**48020**	**69897**	**551763**

Field sampling methods

Vegetation was sampled in a total of 1032 0.04 ha quadrats, a standard size used by the National Herbarium of NSW, National Parks and Wildlife Service and State Forests of NSW in surveys of the coast and tablelands. These were generally square (20 × 20 m) except for some samples on linear landscape features such as beach dunes or riparian alluvium. Where these features were narrower than 20 m, quadrat dimensions were adjusted to ensure landform homogeneity within an area of 0.04 ha. All vascular plant taxa were recorded and allocated cover-abundance estimates on a six-point Braun-

Blanquet scale (Poore 1955). Plant identifications were verified where necessary by checking specimens at the National Herbarium. Records that could not be fully verified (due to inadequate specimens) were excluded from further analysis. Quadrats were searched as fully as possible, however some geophytic and ephemeral species may have escaped detection, depending on the presence of identifiable above-ground organs at the time of sampling. It seems unlikely that these omissions would affect analyses significantly because seasonal geophytes and ephemeral species occur at low frequencies usually at low local abundance in this region.

The height and projective foliage cover were estimated for up to four vertical vegetation strata if present: tree; small tree or tall shrub; shrub; and groundcover. The local terrain was described by measuring slope, aspect and horizon azimuths on eight points of the compass and by qualitative description of landform. Additional notes were made on soil texture and drainage, and evidence of recent disturbance (including fire, logging and physical damage).

Evaluation of additional data

In addition to the 1032 samples described above, a large volume of additional data were available from numerous surveys of local management areas (e.g. Gilmour 1983, Binns & Kavanagh 1990a) and regional surveys of particular habitats (e.g. Floyd 1982, Clarke 1989). These additional data were gathered using a range of different sampling methods which, in some cases, may preclude them from valid analysis with other data. Inclusion of incompatible data within a single analysis may cause results to be influenced more by methodological artefacts than florisitic similarities. Reduction of data to a level of detail that is common to all samples is a potential solution to some of these problems. For example, if some proportion of available samples lacked species abundance estimates or if different abundance measures were applied in different data sets, then all samples could be reduced to species presence/absence data for a common analysis. Differences in abundance measures therefore could not influence results. However, we rejected this approach because we believed variation in species abundance could be important in detecting significant vegetation patterns and because a large number of samples with reasonable coverage of the study area had a common abundance measure (Braun-Blanquet cover abundance). Instead, we set data evaluation criteria to exclude unsuitable samples from analysis.

As a minimal requirement, samples were required to be located on the Australian Map Grid with a precision of at least 100 m. In addition, the following sampling criteria were applied:

(I) Area of plot within the range 0.04–0.1 ha;

(II) Complete list of vascular plant species within the plot;

(III) Species abundances estimated on the six-point Braun-Blanquet cover-abundance scale.

The limits suggested in Criterion I were supported by trial data analyses in which the outcome of cluster analysis was not sensitive to variation in sample size between 0.04 and 0.1 ha. All samples met Criterion I except those of Floyd (1982), Gilmour (1983), Garven (1984), Benson (1994) and Clarke (unpubl.). The dimensions of plots were not recorded in the first three of these surveys (Table 2), however, it is likely that most of Gilmour's (1983) samples fell within the 0.04–1.0 ha range (Gilmour, pers. comm.). The surveys of Benson (1994) and Clarke (unpubl.) used quadrats smaller than 0.04 ha.

With the exception of NPWS (unpubl. 1986) tree survey data, all samples met Criterion II (Table 2). However, it is likely that a few inconspicuous species may have been overlooked in some samples, particularly geophytes which may be absent above ground during certain seasons or years. In a few samples, species richness appeared to be low, particularly for less tractable taxa such as Poaceae, relative to other samples in similar locations and habitats. Most of these samples were linked to particular observers suggesting that some species may have been consistently overlooked. These samples were excluded to ensure precautionary maintenance of data quality.

A large number of samples failed to meet Criterion III (Table 2) because they had species presence/absence data only (e.g. Breckwoldt 1979, SFNSW unpubl.). Another large set of samples had abundance measures other than Braun-Blanquet cover-abundance (Table 2). Examples include qualitative species abundance classes (e.g. Floyd 1982, Gilmour 1983), species frequency scores based on nested quadrats (Outhred 1986), and surveys in which species were assigned multiple abundance estimates for respective strata but no overall estimate for the plot (e.g. Fanning & Mills 1990). In a few cases where raw cover values were estimated for each species (e.g. Dodson et al. 1988), these were converted to Braun-Blanquet cover-abundance scores. Extensive exploratory analyses were carried out to determine whether samples that failed to meet Criterion III could be allocated to the vegetation classes defined by analysis of cover-abundance data of other samples. The exploratory analyses involved the identification of indicator species from presence/absence data in the additional samples. The details of these analyses will not be reported here, but they generally failed to allocate presence/absence samples to classes with an acceptable level of certainty.

Of 2400 additional samples evaluated, 614 met the locational precision criterion and all three sampling criteria (Table 2). With one exception, samples that failed to meet the data evaluation criteria were in areas that were well covered by other samples. The exception involved the extensive area of dissected terrain in Wadbilliga and Bemboka National Parks. Only 30 samples in this area met all criteria while a further 173 samples (Outhred 1986) met all criteria except Criterion III. These 173 samples were included in a supplementary data analysis to provide an adequate description of vegetation patterns in this part of the region.

Botanical nomenclature

Botanical nomenclature was reviewed and standardised across all data sets. There were many instances in which two or more synonyms were applied to the same taxon in different data sets and these were updated to reflect currently accepted nomenclature (Harden 1990–93, and subsequent revisions). In other cases, some observers specified a subspecific or varietal taxon, while others did not. If these species were represented in the region only by a single subspecies or variety, the records were

Table 2. Additional vegetation data evaluated. Data sets marked * met all data evaluation criteria (see text).

Reference	**Location surveyed**	**Number of samples**	**Species recorded**	**Plot size (ha)**	**Abundance measure**
Benson 1994	Monaro grasslands	5	All vascular	0.01	Braun-Blanquet
Binns & Kavanagh 1990a*	Nalbaugh SF	62	All vascular	0.1	Braun-Blanquet
Binns & Kavanagh 1990b*	Nullica SF	91	All vascular	0.1	Braun-Blanquet
Breckwoldt 1979	Bermagui NR, Goura NR, Mimosa Rocks NP, Wallaga Lake NP	385	All vascular	0.1	Presence/absence
Clarke 1989*	NSW Coastal dunes	84	All vascular	0.04	Braun-Blanquet
Clarke unpubl.	Southern NSW saltmarsh	141	All vascular	0.0025	Braun-Blanquet
Dodson et al. 1988*	Tantawangalo catchment	30	All vascular	0.1	% Cover
Fanning & Clark 1991*	Jingera, Nullica SF	66	All vascular	0.1	Braun-Blanquet
Fanning & Fatchen 1990*	Wog Wog Ck	113	All vascular	0.1	Braun-Blanquet
Fanning & Mills 1989	South Rockton, Bondi SF	71	All vascular	0.1	Frequency index
Fanning & Mills 1990	Myanba Ck	107	All vascular	0.1	Qualitative index
Fanning & Mills 1991	Stockyard Ck	66	All vascular	0.1	Qualitative index
Floyd 1982	Eden rainforests	11	All vascular	undefined	Qualitative index
Garvin 1984	Ben Boyd (South) NP	26	All vascular	undefined	Qualitative index
Gilmour 1983	Nadgee NR	65	All vascular	undefined	Qualitative index
Lane et al. 1998*	Bermagui NR, Biamanga NP, Goura NR, Wallaga Lake NP	73	All vascular	0.1	Braun-Blanquet
Outhred 1986	Wadbilliga NP	173	All vascular	0.1	Frequency score
NPWS unpubl. 1986	South east NSW	183	Trees	0.1	Presence/absence
State Forests* (NSW)	Coolangubra Escarpment FR	22	All vascular	0.1	Braun-Blanquet
State Forests* (NSW)	Illawambra FR	21	All vascular	0.1	Braun-Blanquet
State Forests* (NSW)	Mt Poole FR	24	All vascular	0.1	Braun-Blanquet
State Forests* (NSW)	Waalimma FR	22	All vascular	0.1	Braun-Blanquet
State Forests* (NSW)	Yambulla FR	6	All vascular	0.1	Braun-Blanquet
State Forests (NSW)	Yambulla catchments	558	All vascular	0.1	Presence/absence

updated by adding the appropriate epithet. For species with more than one subspecific or varietal taxon in the region, the unresolved records were deleted if these were few in number relative to resolved records, or otherwise all of the records were reduced to the species level. A regional species list was compiled from the sample data and supplemented by additional records from the literature (e.g. Binns 1987) and herbarium collections (see Keith et al. 1999).

Cluster analyses and definition of floristic assemblages

A preliminary cluster analysis was carried out on a core set of 1066 samples for an interim forest assessment (Keith et al. 1995). The analyses were carried out using PATN computer programs (Belbin 1994) and were similar to those used in an earlier study by Keith & Sanders (1990). Compositional dissimilarity among samples was calculated using the symmetric version of the Kulzcynski coefficient applied to unstandardised cover-abundance data (Faith et al. 1987). An unweighted pair-group arithmetic averaging (UPGMA) clustering strategy was applied to the resulting association matrix (Belbin and McDonald 1993) to derive a hierarchical classification. Homogeneity analysis (Bedward et al. 1992b), a technique that measures the extent to which group splitting yields improvements in overall homogeneity of all groups based on inter-sample dissimilarities, was applied to the hierarchical classification. The trend of diminishing gains in homogeneity was used to identify a level in the hierarchy (dendrogram) from which lineages were to be interpreted for the definition of floristic groups. These lineages were interpreted at successively lower levels in the hierarchy by assessing differences between sister groups (Keith & Sanders 1990) with respect to diagnostic species, vegetation structure and physical attributes (elevation, aspect, parent material, distribution). Interpretation using these attributes is consistent with JANIS' (1996) criteria for forest ecosystem definition, viz. 'units should be defined in terms of floristic composition in combination with substrate and position in the landscape.' Floristic groups were recognised when further splitting failed to discernibly resolve variation in any of these factors. The number of groups in the classification was therefore limited by the identification of prominent differences in species composition, vegetation structure and physical habitat.

A nearest neighbour check was carried out to identify samples that may have been misclassified during the clustering procedure, an artefact that may sometimes occur in hierarchical clustering strategies (Belbin 1994). Samples with fewer than two of their five nearest neighbours within the provisional unit to which they were allocated were identified for further evaluation. Alternative allocations of these samples were considered by examining the group affinities of nearest neighbours and respective values of structural and environmental variables.

The classification was modified and refined with new data that became available after the interim forest assessment. As stated previously, the collection of new data was directed to fill gaps identified by iterative assessment of the sample stratification. Further analyses were conducted on an expanded data set to assign new samples to floristic groups in the existing classification and, where new variation was apparent, define additional groups. Consensus between four analyses was used to establish relationships between new samples and the classification groups defined by analysis of the core data (Table 3). These included further cluster and nearest neighbour analyses as described previously, group centroid analyses and indicator species allocation analyses. Group centroid analyses were carried out using ALOC (Belbin 1987, 1994) to determine the five nearest group centroids to each new sample. Indicator species allocation analyses allocated new samples to classification units using the dendrogram as a decision rule structure for the presence or absence of species (Bedward & Keith unpubl.). The method delivers an indeterminate result for samples with no informative species or where different species give conflicting information on group membership.

Where cluster analysis agglomerated new samples into discrete dendrogram lineages, these were assessed against sister lineages and new floristic groups were recognised as described previously. The remainder of new samples were assigned to existing floristic groups using rules to assess consensus among the four alternative allocation analyses (Table 3). Four hundred and six of the 614 new samples met one or more of the consensus rules and were added to the core set of 1066 samples. Conversely, 208 of the new samples failed to meet any of the consensus rules indicating significant conflict between the four allocation analyses. In these cases, the new samples could not reliably be assigned to a floristic group and were excluded from further analysis to avoid the introduction of methodological artefacts into the results.

To address a significant gap in sample stratification, it was necessary to carry out supplementary analyses including samples from Outhred's (1986) survey of Wadbilliga National Park. Species abundance was estimated in these samples using a frequency index (Table 2) that was analytically incompatible with Braun-Blanquet cover-abundance estimates. In the supplementary analyses all data were reduced to presence/absence format and subject to cluster analysis and lineage interpretation as described previously. Lineage interpretation resulted in recognition of some new floristic groups recorded only in the Wadbilliga survey. The new groups accounted for 91 of Outhred's (1986) 173 samples. The remaining new Wadbilliga samples were then either assigned to existing floristic groups by consensus among the four allocation analyses (Table 3), accounting for a further 41 samples or excluded from further analysis if they could not be reliably assigned (41 samples). Thus, the total number of samples assigned to floristic groups was 1604, including 132 from the Wadbilliga data set.

Table 3. Consensus rules for assignment of new samples to existing floristic groups.

A new sample was assigned to an existing floristic group (Group x) if any of the following conditions were met:

1 Three or more of its five nearest neighbours belong to Group x;

2 Allocated to Group x by cluster analysis AND at least one of five nearest neighbours belongs to Group x AND closest centroid is Group x;

3 Allocated to Group x by cluster analysis AND at least one of five nearest neighbours in Group x AND indicator species analysis suggests exclusive membership of Group x;

4 Allocated to Group x by cluster analysis AND at least two of five nearest neighbour belong to Group x AND second closest centroid is Group x;

5 Allocated to Group x by cluster analysis AND at least two of five nearest neighbours belong to Group x AND indicator species analysis suggests membership of Group x and no more than three other groups.

Description of Floristic Assemblages

Floristic assemblages were assigned vernacular names to impart to readers a mental picture of the vegetation and its habitat or distribution. Names were composed of up to four parts. The last part of the name describes vegetation structure (e.g. rainforest, forest, woodland, scrub, heath, swamp, grassland). Other parts of the name may include a place name (e.g. Wadbilliga, Waalimma, Eden) or landform (e.g. coastal, hinterland, tableland) and/or terms describing understorey strata (e.g. layered, wet fern, dry grass, dry shrub). Where possible, comparisons were drawn with similar types of vegetation described in adjacent regions (e.g. Austin 1978, Forbes et al. 1982, Woodgate et al. 1994).

Each floristic assemblage was described using summaries of the sample data to produce profiles of species composition, vegetation structure and physical habitat. Diagnostic species were identified for each floristic group in a fidelity analysis of the final set of 1604 samples described above. Diagnostic species were defined by the extent to which their occurrence at regional and local scales discriminated the target assemblage from residual vegetation (pooled samples of all other assemblages) as shown in Table 4 (after Westhoff & van der Maarel 1978). Species' occurrences at regional scales were represented by their frequency among quadrats, while their local abundances were represented by median cover-abundance within quadrats. For a few assemblages not represented among the 1604 samples (i.e. groups confined to the Wadbilliga area, grassland and saltmarsh) it was necessary to carry out additional analyses on data that did not meet the criteria for inclusion in a combined analysis (Benson 1994, Outhred 1986, Clarke unpubl.).

Three categories of species were defined (Table 4): positive diagnostic species (those more likely to occur within the target floristic assemblage than in all others); negative diagnostic species (those unlikely to occur within the target assemblage but generally abundant elsewhere); and frequent species (those common or dominant in the target assemblage, but also likely to be common in others). All tree species recorded were listed in the descriptions of each floristic assemblage for context, irrespective of whether they met any of the three diagnostic criteria.

Table 4. Definitions of diagnostic species (modified from Westhoff & van der Maarel 1978). C/A refers to median Braun-Blanquet cover-abundance value (after Poore 1955).

		Residual Assemblages		
		Frequency < 0.5 AND C/A ≥ 2	Frequency ≥ 0.5 OR C/A < 2	Frequency $= 0$
Target Assemblages	Frequency ≥ 0.5 AND C/A ≥ 2	Frequent	Positive diagnostic	Positive diagnostic
	Frequency < 0.5 OR C/A < 2	Negative diagnostic	Uninformative	Positive diagnostic
	Frequency $= 0$	Negative diagnostic	Uninformative	-

The vegetation structure of each floristic assemblage was described by calculating the frequency of occurrence, mean height and percentage cover of each of four vertical life-form strata. The four strata were trees, small trees/tall shrubs, shrubs and herbs/graminoids.

The physical habitat of each floristic assemblage was characterised by calculating summary statistics for terrain variables, precipitation and parent material from the sample data. These summaries included: the frequency of occurrence on nine classes of parent material (Holocene coastal sands, Holocene riverine alluvium, Tertiary alluvium, Devonian high-quartz sedimentaries, Ordovician high-quartz sedimentaries, Devonian rhyolite, low quartz sedimentaries, Devonian granitoids and Tertiary and Devonian basalt); frequency of occurrence in four aspect classes (flat, north, west or east, and south); mean and interquartile ranges of altitude, slope and mean annual precipitation (latter calculated from modelled data, Table 5).

Gradient Analysis

Gradient analysis was carried out to gain an understanding of environmental relationships that may be useful predictors of the spatial distribution of floristic assemblages. A semi-strong hybrid multidimensional scaling ordination (Belbin 1991) was applied to the set of 1604 samples to examine relationships between floristic composition and environmental gradients. An association matrix was calculated using the symmetric form of the Kulzcynski coefficient, as for the cluster analysis described previously. Ratio regression was applied to association values less than 0.9, while ordinal regression was applied to values above this cut point. Ordinations were derived from 10 random starting configurations and a maximum of 50 iterations were allowed unless earlier termination was accepted when reductions in stress between successive iterations fell below 0.005. Ordinations were applied in an increasing number of dimensions to determine a parsimonious solution with comparatively low stress in a small, manageable number of dimensions. Vectors representing 19 terrain, substrate and climatic variables (Table 5) were fitted to the parsimonious ordination and their rank correlations with floristic trends were calculated. The variables used were: altitude; slope, two aspect indices, topographic roughness and position indices at three neighbourhood sizes each, local topographic position index, wetness index, solar radiation index, annual preciptation, precipitation of the driest and wettest months, mean maximum and minimum temperatures of the hottest and coldest months, respectively, and substrate nutrient index. The nutrient index was derived by arranging classes of parent material into an ordinal sequence, starting with the least fertile as follows: Holocene coastal sands; Tertiary alluvium, Devonian high quartz sedimentaries; Devonian rhyolite; Ordovician high quartz sedimentaries; Devonian granitoids; low quartz sedimentaries; Holocene riverine alluvium; and Tertiary/Devonian basalts.

Environmental and remote spatial data

A set of spatial data layers were rasterised to 25 m square grid cells for use in vegetation modelling. Terrain variables were derived from a 25 m grid digital elevation model supplied by the NSW Land Information Centre (Table 5).

Table 5. Spatial data layers used in mapping.

Spatial Variable	Description
Terrain	
Altitude	Elevation above sea level (metres)
Slope	Inclination from horizontal (degrees)
Aspect	Deviation from grid north perpendicular to slope (degrees)
Sine Aspect Index	Continuous index (0–100) calculated as 100 times sine of half aspect value in degrees (flat sites allocated missing values)
Ordinal Aspect Index	Categorical index of aspect (0: flat, 1: 301–30°, 2: 211–300°, 3: 31–120°, 4: 121–210°)
Solar Radiation Index	Continuous index representing topographic exposure to solar radiation calculated from slope, aspect, horizon azimuth and latitude. Varies below 100 for sheltered sites and above 100 for exposed sites
Wetness Index	Continuous index representing the volume of water draining to a given point in the landscape (after Moore et al. 1993)
Local Topographic Position (S)	Continuous index (0–100) representing proportional distance between local ridge (100) and local gully (0) (after Skidmore 1990)
Neighbourhood Topographic Position (250 m)	Difference between altitude of a central grid cell and mean altitude of surrounding cells within a 250 × 250 m neighbourhood
Neighbourhood Topographic Position (500 m)	Difference between the altitude of a central grid cell and mean altitude of surrounding cells within a 500 × 500 m neighbourhood
Neighbourhood Topographic Position (1000 m)	Difference between the altitude of a central grid cell and mean altitude of surrounding cells within a 1000 × 1000 m neighbourhood
Neighbourhood Topographic Roughness (250 m)	Standard deviation of altitude within a neighbourhood of 250 × 250 m
Neighbourhood Topographic Roughness (500 m)	Standard deviation of altitude within a neighbourhood of 500 x 500 m
Neighbourhood Topographic Roughness (1000 m)	Standard deviation of altitude within a neighbourhood of 1000 × 1000 m
Climate	
Annual Rainfall	Mean total yearly rainfall (mm)
Rainfall of Wettest Month	Maximum mean monthly rainfall (mm)
Rainfall of Driest Month	Minimum mean monthly rainfall (mm)
Minimum Temperature of Coldest Month	Mean minimum monthly temperature (°C)
Maximum Temperature of Hottest Month	Mean maximum monthly temperature (°C)
Substrate	
7-class Parent Material	Major geological formations
28-class Parent Material	Dominant lithologies
106-class Parent Material	Lithological classes
Land cover	
Vegetation Structure	Major vegetation formations (excluding temperate rainforest) determined from aerial photos
Temperate Rainforest	Rainforest determined from aerial photos
Forest Types	Baur (1989) types and mosaics interpreted from aerial photos .
Extant Native Vegetation Cover	Presence of extant native vegetation determined from Landsat TM
Location	
Distance from Coast	Shortest distance from coast (metres)
Easting	Australian map grid
Northing	Australian map grid

The derived variables represented topographic position, relief, shelter and soil moisture at varying spatial scales.

Climatic surfaces (Table 5) were derived using ESOCLIM (Hutchinson 1989). The sparse distribution of weather stations within the region, and consequent scarcity of weather data, precluded quantitative evaluation of the climatic surfaces. Modelled temperature surfaces were very closely related to altitude and patterns due to local frost hollows were likely to be under-represented. Similarly, rainfall surfaces possibly underestimated regional orographic effects, although intuitively expected patterns were evident.

Spatial data for parent material supplied by the Bureau of Resource Sciences were based on a revision of earlier maps by Barnes & Herzberger (1975) and Beams & Hough (1984) and recent field observations. The classification was modified to distinguish coastal sands from other Holocene alluvium; Lochiel Basalt from associated Devonian lithologies; and Genoa Sandstone beds from other Devonian sediments (Barnes & Herzberger 1975). The final classification included 106 lithological units within the Eden region. Related units were lumped according to dominant lithology into 28 classes and these were lumped further into 7 major formations to provide three hierarchical spatial coverages of substrate (Table 5).

A GIS coverage differentiating native vegetation from cleared land and plantations of exotic species was prepared by manual interpretation of a Landsat TM image taken in 1989 and a map of existing plantations. This coverage was used as training data for a spectral classification of a Landsat TM image taken in 1994. It was assumed, consistent with field observations, that negligible land clearance occurred between 1994 and 1998.

A GIS coverage differentiating major structural types of native vegetation was prepared by manual interpretation of 1:25 000 scale black and white aerial photographs flown in 1963 (Table 5). For small parts of the area where these were unavailable photographs flown in 1979 and 1990 were used. Mapped occurrences of various structural types were checked using the sample data and observations gathered during field traverse. A separate coverage of rainforest was prepared from colour aerial photographs flown in 1994 as part of the Eden CRA old growth mapping study.

Forest Type maps (Baur 1989) prepared by State Forests of NSW and by National Parks and Wildlife Service were also included in the spatial data set for modelling.

Attribute values were extracted from each spatial data layer for all samples to be used in spatial modelling and validation. Samples were located in the field to a resolution of 100 m. They were assigned to a 25 m × 25 m pixel which had an altitude closest to the mean value within the relevant 100 m grid cell (4 × 4 pixel neighbourhood). This assignment procedure was designed to minimise errors in relation to the spatial data layer (digital elevation model) from which most others were derived.

Spatial Interpolation and Mapping

A hybrid decision tree/expert system technique was selected as the preferred approach for modelling the spatial distribution of the 79 floristic groups (map units). This technique describes the distribution of map units using decision rules that comprise a series of quantitative statements about spatial variables connected by conjunctions. The distribution of each map unit may be described by one or more mutually exclusive rules. Reasons for choice of this method include:

- the method is explicit and repeatable relative to intuitively based mapping techniques;
- the method is free from statistical constraints and assumptions about the structure of the data;
- the method is efficient because sets of decision rules are developed simultaneously for all map units, rather than individually; and
- the method allows for intervention by experts in an explicit manner through the choice and design of decision rules.

This latter capability is a major strength because it provides a framework for incorporating non-formal expert knowledge into the map. This kind of knowledge is difficult to build into statistical models, which traditionally rely upon quantitative sample data (e.g. Austin et al. 1984). While intuitive mapping allows qualitative knowledge to be incorporated, this generally occurs in the absence of an explicit framework (e.g. Keith & Benson 1988) such as that offered by a decision rule approach.

The main disadvantage of decision tree models relative to parametric models (e.g. generalised linear and additive models) is that they utilise fewer and fewer samples as more variables are fitted. Consequently, inadequate sampling of environmental space may be more limiting, at least superficially, for decision tree models. Statistical models rely upon environmental relationship established across the data set as a whole and consequently these are called upon to make predictions where sampling intensity is low. Comparative studies on the prediction of distributions of individual species suggest that generalised linear models and generalised additive models return slightly more accurate predictions than decision tree models (Ferrier & Watson 1997). However, these trials excluded expert intervention, a major strength of the approach employed here. In a comparative species modelling study, Elith et al. (1998) concluded that expert knowledge is likely to be useful, at least in the selection of appropriate variables for modelling. However, no comparative studies have yet been carried out on the modelling of multi-species assemblages.

Interactive modelling software (ALBERO) was developed to explore and implement alternative sets of decision rules. The software generates decision rules by statistical induction and facilitates expert intervention at various stages of model development. At each node in the decision tree, ALBERO displays all significant statements that discriminate different floristic classes by spatial variables (within a user-specified critical value) and nominates appropriate thresholds for discrimination. Significance is calculated using the Chi-squared statistic. For continuous and ordinal variables, nodes are always split dichotomously at the significant value closest to the midpoint of variation. Non-ordinal categorical variables will split nodes into as many branches as account for significant discrimination of map units. Where two or more spatial variables discriminate ecosystems significantly, the user chooses a selection. Users may reduce the critical value to inspect a wider range of potential splits. A decision rule (ie. branch of the decision tree) is complete when there are no further significant splits at the nominated critical value.

ALBERO accommodates explicit expert intervention in the modelling process by offering a choice between multiple significant variables at each node, facilitating exploration of alternative tree structures, allowing non-significant splits to be forced, and allowing definition of data-free terminal nodes. The latter facility accommodates qualitative observations by experts where no quantitative data are available.

A decision-tree model of floristic groups in the Eden region was developed using 1450 of the 1604 allocated samples. Use of these samples assumed that no substantial vegetation changes occurred during the sampling period (1987–1997). Significant regional-scale spatial variables (parent material, rainfall and temperature) were selected at early stages of tree construction, while attention turned to local-scale variables (e.g. terrain) to discriminate smaller groups of samples representing different map units. The model was developed iteratively by checking distributions predicted by particular sets of rules and adjusting tree structure as necessary (see below). Terminal nodes were allocated to the map unit represented by the greatest number of samples. Where there was a tie, expert knowledge was applied to choose a suitable option.

The final set of decision rules was applied to the full set of spatial data layers (Table 5) to allocate all 25 m grid cells in the study area to a map unit. Several small polygons remained unassigned to map units because some of the finest-scale (106–class) geological units were not sampled within the relevant climatic and terrain envelope. These polygons were assigned to a map unit either by using data on a related geological class or by assigning cells to the same map unit as their nearest assigned neighbour. The model output was then smoothed to remove small artefactual features. The resulting map represented the pre-1750 distribution of floristic groups, a baseline required for the Comprehensive Regional Assessment (JANIS 1996). This was cut using the Landsat coverage of extant native vegetation cover (Table 5) to derive the extant distributions of map units.

Map validation

Three complementary approaches were used in map validation: qualitative checking, description of map reliability and quantitative accuracy assessment. Qualitative checking procedures were incorporated into the development of the map. The decision-tree model was broken down into manageable components for proofing. The checking process was carried out by an experienced field botanist (DK) and consisted of the following steps.

(1) A small number of rules (5–12) were extracted from the model and implemented on the spatial data to display the distribution of respective map units.

(2) The mapped distributions were examined in relation to the regional distribution of their samples.

(3) The fine-scale distributions of map units were examined with reference to topographic maps to determine whether appropriate landscape relationships were reflected (e.g. that sheltered gullies generally support either similar or more mesic vegetation than adjacent ridges, but not less mesic vegetation).

(4) The sources of all identified anomalies were traced to particular nodes in the decision tree and the sample data were examined to explore alternative rule pathways below the node identified.

(5) The model and map were revised and proofing steps 1–5 were repeated until all identified anomalies were resolved.

When model development was well advanced, further refinements were sought from two other experienced field botanists (Doug Binns, State Forests of NSW; Jackie Miles, consultant, Brogo).

Sampling density was used to describe map reliability across the study area. The 1450 samples used to construct the decision tree model were used to calculate the number of samples within a 5 km^2 radius of each 100 m grid cell. Sampling density was calculated by dividing the number of samples by the area of extant native vegetation in each circular neighbourhood. Six classes of sampling density were defined in terms of the number of samples per square kilometre of extant native vegetation. The distribution of these classes was mapped in all parts of the study area supporting extant native vegetation.

One hundred and fifty-four (approximately 10%) of the 1604 samples selected for data analysis were withheld from modelling for accuracy quantification. These validation samples were used to test model predictions against independent observations at varying spatial scales relevant to map usage. These spatial scales were represented by spatial neighbourhoods of varying size around the validation samples. Validation samples were selected at random from all map units excluding those with less than 20 samples so as not to unduly constrain modelling options for these less common units.

The principal aim of accuracy quantification was to determine the likelihood that selection of an area to represent a given floristic assemblage in a reserve actually contained the assemblage predicted on the map. Planning units used for reserve selection in the Eden Comprehensive Regional Assessment varied in size from approximately 20 ha to 240 ha with a median size around 100 ha. Validation samples were thus compared to mapped units within circular neighbourhoods with the following radii and area to determine error rates at spatial scales relevant to map usage: 100 m (3 ha); 200 m (12 ha); 300 m (28 ha); 400 m (50 ha); 500 m (79 ha); 600 m (112 ha); 700 m (153 ha); 800 m (201 ha); 900 m (253 ha); and 1 000 m (314 ha). The percentages of correct and incorrect matches were recorded as an estimate of map accuracy and statistical errors were calculated from the binomial distribution.

Results

Classification and description of floristic assemblages

The hierarchical classification derived from cluster analysis is summarised in a simplified dendrogram (Fig. 4). Thirty-three dendrogram lineages were identified for further interpretation using homogeneity analysis. A number of these lineages were not split further, while others were resolved into several floristic assemblages that were related to qualitatively different habitats defined by substrate and position in the landscape. The following example shows how complex variation in one dendrogram lineage was resolved into six floristic groups (refer to first six groups in Fig. 4).

The parent lineage contains 90 samples with a diverse range of dry forest species. Samples encompass altitudinal range of 15–915 m on a range of granitoid, sandstone, mudstone and alluvial parent materials, across all aspects on flat and dissected terrain. Samples are distributed throughout the coast and southern parts of hinterland and tableland range.

The first split segregated a group of samples restricted to sandstone on steep northern and western aspects of Mt Imlay, Nungatta Mountain and Bondi Gulf at 330–750m elevation. Samples indicate a forest less than 20 m tall dominated by *Eucalyptus agglomerata* and prominent ground stratum. Further splitting failed to resolve substantial variation within this group. It was therefore recognised and mapped (map unit 50 in Fig. 4).

The second split resulted in two further groups. The first of these included samples distributed widely on coastal ranges and inland mountains which, when split again, yielded one subgroup dominated by *Eucalyptus sieberi* and largely confined to tonalite lithology in the Mumbulla Mountain area, and another subgroup dominated by *Eucalyptus agglomerata, Eucalyptus sieberi* and *Allocasuarina littoralis* that was more widespread on sedimentary lithologies of coastal and hinterland ranges. Further splitting failed to resolve substantial variation within these subgroups which were recognised and mapped (map units 48 and 49, respectively, in Fig. 4).

The remaining sample groups in the lineage were resolved into three map units in a similar manner. They were: 46A (low forest dominated by *Eucalyptus consideniana* restricted to granitoids and Tertiary alluvium in the Timbillica area); 46B (taller forest dominated by *Corymbia gummifera* and *E. sieberi* confined to sediments and Tertiary alluvium on the coastal strip); and 47 (taller forest dominated by *Angophora floribunda* and *E. sieberi* confined to sediments south of Pambula).

Alternative interpretations of the hierarchy yielding greater and fewer map units were considered in the manner described above. A total of 79 map units were recognised in the vegetation classification. These included 61 floristic groups that were interpreted from the 33 dendrogram lineages identified initially using homogeneity analysis. Six additional assemblages were recognised in the supplementary analysis of presence/absence data including samples from Wadbilliga National Park. A further nine units including eight estuarine wetlands and one grassland were recognised independently of the numerical analyses and described either using available

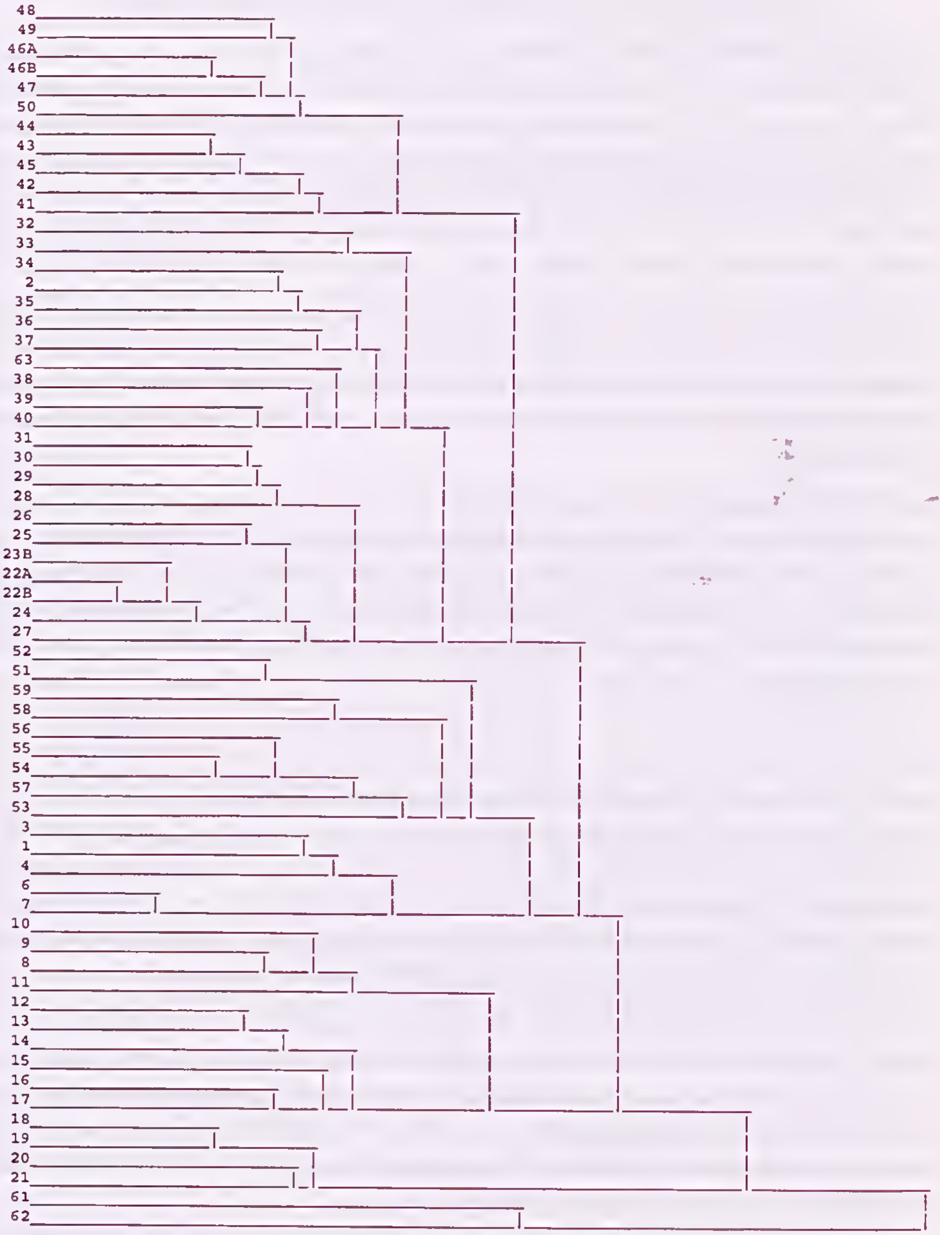

Fig. 4. Simplified dendrogram showing floristic relationships based on samples with Braun-Blanquet cover-abundance estimates.

qualitative observations from the field or the literature, or using available quantitative data that were unsuitable for inclusion in the cluster analyses (e.g. Benson 1994, Clarke unpubl.)

The Appendix describes the floristic composition, vegetation structure, physical habitat and distribution of samples for each map unit. Four of the 79 map units (67–70) were restricted to estuaries below low tide mark (sea grass meadows). A further four units (63–66) were estuarine wetlands associated with the high tide mark. Of the remainder, 47 map units were forests dominated by eucalypts, six were rainforests or scrubs with rainforest affinities, 10 were shrublands or heathlands, 3 were swamps and 2 were grasslands. The 47 types of eucalypt forest varied from tall forests with mesophyllous shrub, fern or herbaceous understories, to intermediate and dry forests with grassy or sclerophyllous shrub understories.

There was close correspondence between the current floristic classification and that based on an earlier analysis of a smaller data set (369 samples, Keith & Sanders 1990). Thirty-four floristic assemblages were related on a 1:1 basis to units defined in the earlier study (Table 6). In five cases two (map units 5 and 6, 16 and 17, 44 and 45, 46A and 46B) or three (e.g. map units 11, 12 and 15) of the currently recognised assemblages corresponded to a single unit in the earlier classification (Table 6). The additional data now available allowed resolution of poorly sampled vegetation classes that were not previously recognised. Conversely, three of the currently recognised assemblages (map units 26, 35 and 56) corresponded with two previously recognised units. In these cases, additional sampling suggested there was greater overlap between the units in the earlier classification than previously recognised. Three of Keith and Sanders' (1990) communities were originally defined in the absence of quantitative data and were resolved as follows: Community 18 in the Bega and Towamba valleys (resolved into map units 18–21); Community 19 on the Monaro Tableland (resolved into map units 22–24); and Community 41, the estuarine complex (resolved into map units 63–70). Eleven assemblages had locally restricted distributions and were not previously sampled (map units 2–4, 28, 29, 39, 40, 52, 54, 60 and 62). The remaining seven previously unrecognised units (22B, W1–W6) were introduced to describe vegetation in the Wadbilliga-Numeralla area which was not included in the previous study (Table 6).

Regional flora and species richness

A total of 1522 vascular indigenous plant taxa were represented by confirmed records in the region (Keith et al. 1999). A further 136 taxa were recorded, but require confirmation. Some previous records were determined to be erroneous identifications, while a number of others remain doubtful. Three hundred and seventy-five introduced plant taxa were recorded, but this is likely to underestimate the regional alien flora because highly disturbed habitats that are favourable to such species, such as pastures and wastelands, were under-represented in sampling (Keith et al. 1999).

Species richness of terrestrial vegetation varied from 2 to 81 per 0.04 ha, with a regional mean of 30 and inter-quartile range of 23–40. There was considerable variation in species richness between floristic assemblages (Table 7). The most species-

Table 6. Correspondence between floristic assemblages described in this study with those described by Keith and Sanders (1990).

This study	Keith & Sanders(1990)
1	1
2	not sampled
3	not sampled
4	not sampled
5	2(I)
6	2(I)
7	2(II)
8	3
9	4
10	5
11	not sampled but referable to 6
12	6
13	9(I)
14	9(II)
15	6
16	7
17	7
18	not sampled but referable to 18
19	not sampled but referable to 18
20	not sampled but referable to 18
21	not sampled but referable to 18
22A	not sampled but referable to 19
22B	outside study area
23A	not sampled but referable to 19
23B	not sampled but referable to 19
24	38
25	20
26	37, 21
27	13
28	not sampled but referable to 14
29	not sampled but affinities with 7 and 22
30	17
31	14
32	30
33	26(II)
34	12
35	16, 15
36	32
37	10
38	11
39	not sampled but referable to
11	
40	not sampled
41	23
42	27
43	22
44	24
45	24
46A	28
46B	28
47	29
48	26(I)
49	26(I)
50	20
51	25
52	not sampled but referable to 25
53	35
54	not sampled but referable to 33
55	33
56	34, 36
57	39
58	8
59	40
60	not sampled
61	31
62	not sampled
63	not sampled but referable to 41
64	not sampled but referable to 41
65	not sampled but referable to 41
66	not sampled but referable to 41
67	not sampled but referable to 41
68	not sampled but referable to 41
69	not sampled but referable to 41
70	not sampled but referable to 41
W1	outside study area
W2	outside study area
W3	outside study area
W4	outside study area
W5	outside study area
W6	outside study area

rich assemblages (map units 19 and 34) were semi-mesic assemblages with a high diversity of both shrubs and herbs contributing on average to more than 45 species per 0.04 ha. Other species-rich assemblages with more than 40 species per 0.04 ha (map units 13, 17, 18 and 30) generally had large numbers of herb species in the ground stratum but fewer shrub species. Mesic eucalypt forests (map units 11–19) and dry grassy eucalypt forests of the coastal valleys (map units 20–21) and hinterland (map units 27–31 and 35) had species richness consistently above 32 species per 0.04 ha (Table 7). Some intermediate forests (map units 34 and 37) and dry shrubby forests at low elevation (map units 46A and 46B) also had richness values in this range. These low elevation assemblages excepted, dry shrubby eucalypt forests (map units 25, 41–50) generally have 20–30 species per 0.04 ha. In low rainfall areas, the dry shrubby forests on quartz-rich sediments (map units 25, 50, W1–W5) and dry grassy forests and woodlands on the tableland had low levels of species richness (16–24 species per 0.04 ha, and 11 per 0.01 ha for Map Unit 23A). Rainforests (map units 1, 5–8), layered forests (map units 2, 3, 9 and 10) and heathlands (map units 53–56 and 61) had variable levels of species richness, the coastal assemblages generally having more species than the elevated montane assemblages (Table 7). Freshwater swamps (map units 57–60) had moderate richness levels, while estuarine wetlands (map units 63–70) and beach strand (map unit 62) generally had very few species.

Gradient Analysis

Four ordination axes were required to summarise regional floristic variation parsimoniously (stress values of 0.33, 0.26 and 0.20 were returned for configurations in 2, 3 and 4 dimensions, respectively). Altitude had the highest correlation with floristic composition, while minimum temperature of the coldest month, annual rainfall and rainfall of the driest month were also strongly correlated with composition (Table 8). These relationships reflect regional scale patterns in vegetation. The variables may be expected to correlate strongly with each other (Fig. 5), given orographic influences on rainfall and adiabatic lapse related to altitude, even though rainshadows and frost hollows may cause subregional deviations from general altitudinal relationships. A suite of topographic variables including neighbourhood indices at all three scales and slope were moderately correlated with floristic composition (Table 8), as was substrate nutrient index. These relationships reflect primarily local-scale patterns in vegetation. While the topographic variables were correlated to varying degrees with each other, substrate nutrient index was largely unrelated to all other environmental variables examined (Fig. 5). There may be additional relationships between floristic composition and substrate that were not adequately represented by the simple ordinal nutrient index. Variables representing the finest scale variation in topography (e.g. aspect indices, radiation, local topographic position and wetness) were the least correlated with floristic composition. This may be due in part to the poor representation of complex fine scale relationships in a large data set reduced to 4 dimensional space.

Table 7. Native species richness of major vegetation formations at scales ≤ 0.1 ha.

Floristic assemblage	Species richness mean	se	n	Sample area (ha)
1	28	5	6	0.04
2	32	3	5	0.04
3	27	3	13	0.04
4	8	2	3	0.04
5	47	-	1	0.04
6	31	2	13	0.04
7	28	3	10	0.04
8	17	2	5	0.04
9	21	2	11	0.04
10	29	1	80	0.04
11	31	1	18	0.04
12	33	2	31	0.04
13	40	1	70	0.04
14	33	2	36	0.04
15	33	1	132	0.04
16	35	1	32	0.04
17	43	3	19	0.042
18	42	2	16	0.04
19	48	2	38	0.04
20	39	1	48	0.04
21	35	3	28	0.04
22A	16	1	5	0.04
22B	13	3	3	0.04
23A	11	2	5	0.01
23B	17	3	14	0.04
24	26	2	20	0.04
25	22	1	10	0.04
26	32	2	34	0.04
27	38	2	5	0.04
28	34	2	10	0.1
29	39	3	17	0.1
30	42	2	17	0.04
31	38	1	54	0.04
32	31	2	42	0.04
33	27	1	55	0.04
34	46	3	24	0.04

Floristic assemblage	Floristic mean	Species richness se	n	Sample area (ha)
35	37	1	51	0.04
36	22	2	6	0.04
37	35	2	17	0.04
38	22	14	3	0.04
39	37	7	5	0.0
40	27	9	4	0.04
41	21	1	28	0.04
42	30	1	64	0.04
43	34	2	13	0.04
44	30	1	29	0.04
45	29	3	23	0.04
46A	36	0	24	0.04
46B	35	2	19	0.04
47	26	1	19	0.04
48	28	2	19	0.04
49	28	1	48	0.04
50	21	3	5	0.04
51	34	4	14	0.1
52	24	2	8	0.1
53	17	2	21	0.04
54	37	3	6	0.04
55	35	4	8	0.04
56	29	4	5	0.04
57	28	4	9	0.04
58	30	4	14	0.04
59	29	4	7	0.04
60	39	7	3	0.04
61	17	1	41	0.04
62	5	1	30	0.04
63	22	2	4	0.04
64	4	0	141	0.0025
W1	18	1	28	0.05
W2	20	1	15	0.05
W3	20	2	13	0.05
W4	24	2	6	0.05
W5	32	1	22	0.05
W6	33	3	7	0.05

Table 8. Rank correlations of floristic vectors fitted to 4-dimensional ordination space with the environmental variables they represent. Abbreviations for variables refer to Fig. 5.

Environmental Variable	Abbreviation	Correlation
Altitude	Alt	0.657
Minimum Temperature of Coldest Month	Min.T	0.587
Annual rainfall	Ann.R	0.559
Rainfall of Driest Month	Min.R	0.545
Neighbourhood Topographic Roughness (500 m)	Rug.500	0.386
Neighbourhood Topographic Roughness (1000 m)	Rug.1000	0.385
Neighbourhood Topographic Roughness (250 m)	Rug.250	0.384
Slope	Slp	0.371
Rainfall of Wettest Month	Max.R	0.363
Substrate Nutrient Index	Sub	0.335
Maximum Temperature of Hottest Month	Max.T	0.335
Neighbourhood Topographic Position (500 m)	Top.500	0.306
Neighbourhood Topographic Position (1000 m)	Top.1000	0.292
Sine Aspect Index	Asp.s	0.263
Neighbourhood Topographic Position (250 m)	Top.250	0.240
Solar Radiation Index	Rad	0.237
Wetness Index	Wet	0.207
Local Topographic Position	Top.1	0.174
Ordinal Aspect Index	Asp.o	0.127

Vegetation model and map

A hierarchical set of 470 decision rules was developed iteratively to describe the distribution of the 79 map units. Each map unit had between one and 31 rules describing its distribution. The highest order node in the decision tree (Fig. 6) was split according to major structural formations identified from aerial photopattern (rainforest, eucalypt forest, scrub, riparian vegetation, heath, grassland, treeless swamp and estuarine vegetation). Rainforest units were distinguished from one another using classes of aerial photopattern and rule thresholds for rainfall and elevation. The eucalypt forest node was split according to 8-class parent material and each parent material node was in turn segregated using the most informative regional-scale variables (Fig. 6). These included: mean rainfall of the driest month for granitoid substrates, the most widespread parent material in the region; elevation for high-quartz sedimentary rocks; finer scale geological units for basalt and low-quartz sedimentary rocks; and geographic trends for alluvial substrates. Lower order statements in rules describing the distribution of eucalypt-dominated map units were, in most cases, based on local terrain, substrate and eucalypt aerial photopattern. Three scrub map units were distinguished by aerial photopattern and parent material, while aerial photopattern and mean annual rainfall (Fig. 6) distinguished the three riparian units. Heathlands and grassland were segregated using elevation and aerial photopattern, while estuarine units were distinguished on the basis of aerial photopattern.

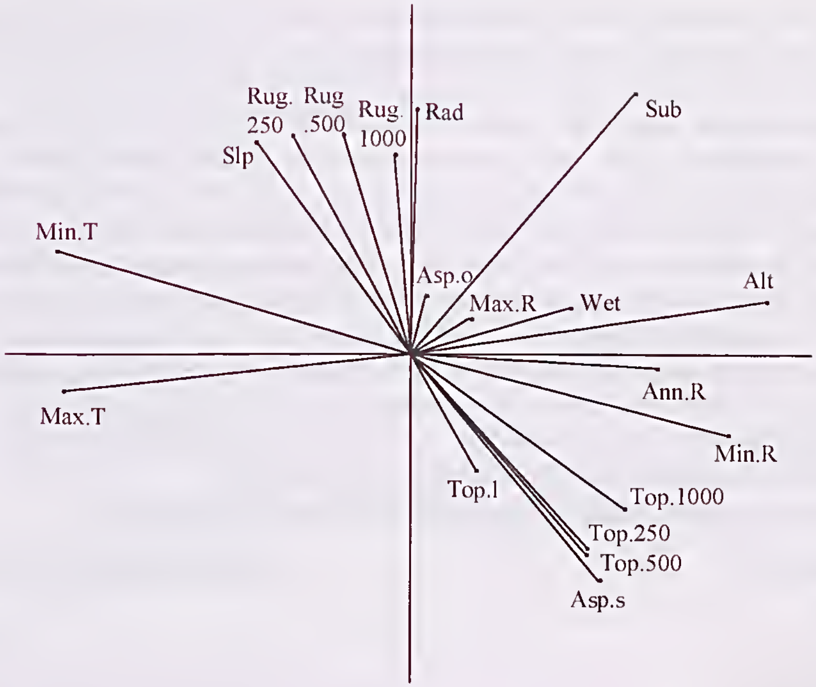

Fig. 5. First two axes of 4-dimensional ordination showing vectors representing environmental gradients in floristic composition. Refer to Table 8 for key to abbreviations.

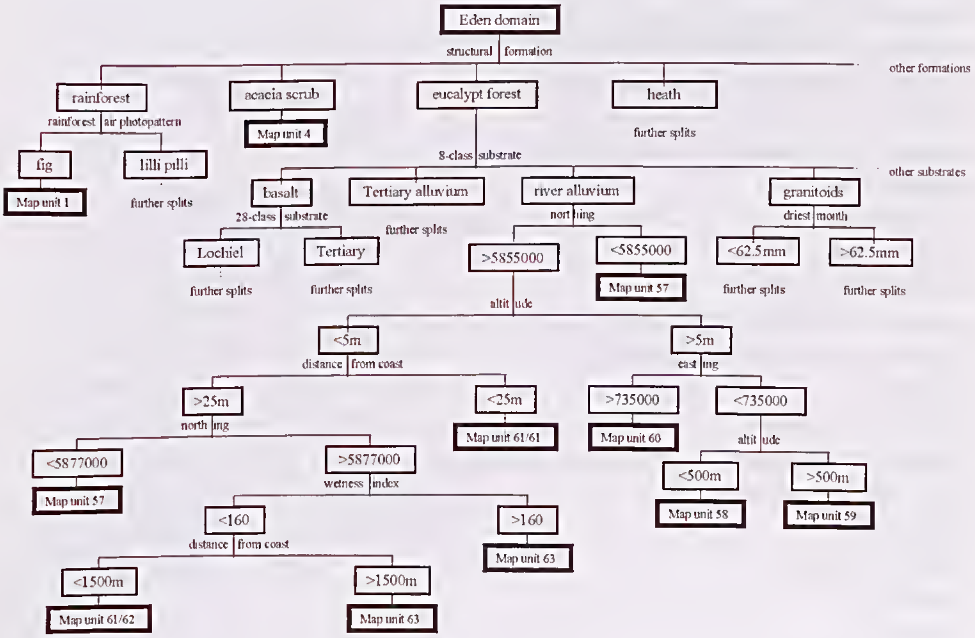

Fig 6. Principal nodes and branches in the decision tree model.

The spatial variables that were most frequently invoked in decision rules were major structural formations (aerial photopattern) and 8-class parent material (Table 9), reflecting their position high in the hierarchy of the decision tree (Fig. 6). Other variables invoked frequently in rules included elevation, mean annual precipitation, mean precipitation of the driest and wettest month, 28-class parent material, mean maximum temperature of the warmest month and topographic position within a 5 x 5 cell neighbourhood (Table 9). Slope, aspect indices and forest type were seldom invoked in decision rules. The frequency with which environmental variables were invoked in decision rules generally reflected the strength of their correlation with floristic composition (Table 8 cf. Table 9). Parent material (8 classes) had a high frequency in decision rules, but a lower ranking correlation with floristic composition. This may reflect the loss of information which occurred with the ordinal transformation of substrate classes that was necessary for vector fitting. Table 10 gives some examples to illustrate different rules used in mapping.

Table 9. Frequency with which spatial variables were invoked in decision rules.

Spatial Variable	% decision rules with variable
Terrain	
Altitude	84
Slope	4
Sine Aspect Index	1
Ordinal Aspect Index	1
Solar Radiation Index	19
Wetness Index	18
Local Topographic Position (S)	6
Neighbourhood Topographic Position (250 m)	22
Neighbourhood Topographic Position (500 m)	11
Neighbourhood Topographic Position (1000 m)	20
Neighbourhood Topographic Roughness (250 m)	13
Neighbourhood Topographic Roughness (500 m)	7
Neighbourhood Topographic Roughness (1000 m)	19
Climate	
Annual Rainfall	64
Rainfall of Wettest Month	57
Rainfall of Driest Month	66
Minimum Temperature of Coldest Month	36
Maximum Temperature of Hottest Month	16
Substrate	
8-class Parent Material	93
28-class Parent Material	48
106-class Parent Material	17
Land cover	
Vegetation Structure	100
Forest Types	1
Location	
Distance from Coast	10
Easting	10
Northing	15

Table 10. Example decision rules.

```
IF Vegetation Formation = eucalypt forest
        AND Parent Material (8 class) = basalt
        AND Parent Material (28 class) = Devonian basalt
        AND Annual rain ≤ 900 mm
THEN map unit = 19

IF Vegetation Formation = eucalypt forest
        AND Parent Material (8 class) = granitoids
        AND Driest month <= 62.5 mm
        AND Altitude ≤ 435 m
        AND Driest month > 50.5 mm
        AND Roughness (1000 m) ≤ 36.5 m
        AND Driest month ≤ 56.5 mm
        AND Parent Material (28 class) = Gabo adamellite OR Wallagaraugh adamellite
        AND Annual rain ≤ 922.5 mm
        AND Roughness (250 m) ≤ 5.5 m
THEN map unit = 26

IF Vegetation Formation = eucalypt forest
        AND Parent Material (8 class) = granitoids
        AND Driest month ≤ 62.5 mm
        AND Altitude ≤ 435 m
        AND Driest month > 50.5 mm
        AND Roughness(1000 m) ≤ 36.5 m
        AND Driest month ≤ 56.5 mm
        AND Parent Material (28 class) = Gabo adamellite OR Wallagaraugh adamellite
        AND Annual rain ≤ 922.5 mm
        AND Roughness (250 m) > 5.5 m
THEN map unit = 46A

IF Vegetation Formation = eucalypt forest
        AND Parent Material (8 class) = granitoids
        AND Driest month ≤ 62.5 mm
        AND Altitude ≤ 435 m
        AND Driest month > 50.5 mm
        AND Roughness (1000 m) ≤ 36.5 m
        AND Driest month > 56.5 mm
        AND Parent Material (106 class) = Dgbb OR Dgic OR Dgkk OR Dgpp OR Dgur
        AND Topographic position (250 m) ≤ 72.5 m
        AND Topographic position (500 m) ≤ 98.5 m
THEN map unit = 17

IF Vegetation Formation = eucalypt forest
```

Table 10. cont.

```
        AND Parent Material (8 class) = granitoids
        AND Driest month £ 62.5 mm
        AND Altitude > 435 m
        AND Altitude ≤ 796 m
        AND Annual rain > 954 mm
        AND Parent Material (28 class) = granodiorite
        AND Altitude ≤ 643.5 m
        AND Parent Material (106 class) = Dgdy OR Dgkk
        AND Altitude > 492 m
        AND Wetness index > 126
THEN map unit = 13
IF Vegetation Formation = eucalypt forest
        AND Parent Material(8 class) = high quartz sediments OR rhyolite
        AND Altitude ≤ 372.5 m
        AND Annual rain ≤ 911.5 mm
        AND Topographic position (1000 m) ≤ 149.5 m
        AND Parent Material (28 class) = Adaminaby sandstone OR rhyolite
        AND Driest month > 52.5 mm
        AND Maximum temperature > 25.5°C
        AND Wetness index > 141
THEN map unit = 13
IF Vegetation Formation = eucalypt forest
        AND Parent Material (8 class) = low quartz sediments
        AND Parent Material (106 class) = Db
        AND Driest month ≤ 58.5 mm
        AND Maximum temperature ≤ 25.1°C
        AND Topographic position (250 m) ≤ 76 m
        AND Solar radiation index ≤ 115
THEN map unit = 13
IF Vegetation Formation = eucalypt forest
        AND Parent Material(8 class) = tertiary alluvium
        AND Easting > 725000
        AND Maximum temperature ≤ 23.6°C
        AND Wetness index > 156.5
THEN map unit = 37
```

The decision rules were implemented on the spatial data layers to produce the vegetation map (inside back cover). Floristic assemblages 61 and 62 were mapped as a mosaic because stands of assemblage 62 were restricted to narrow beach strands and too small to map separately from adjoining stands of assemblage 61 at a scale of 25 m pixels. The map was printed at 1:100 000 scale and is available digitally at 25 m pixel scale on licence (GIS manager, NSW National Parks and Wildlife Service).

Distribution, extent, depletion and reservation of floristic assemblages

Maps in the Appendix show the location of samples assigned to each floristic assemblage and the distribution of their map units excluding areas cleared before 1994 are shown on the vegetation map (inside back cover). Rainforests are scattered in small patches throughout the coastal and tableland ranges, but rarely occur in low relief parts of the hinterland and tableland (Fig. 7g). Mesic eucalypt forests are widespread on the tableland range, more scattered on the coast and hinterland and absent from the rainshadow areas of the lowland valleys and Monaro Tableland (Fig. 7a). Intermediate eucalypt forests occur mainly on the coastal ranges (Fig. 7b). Warm temperate dry grassy eucalypt forests occupy the lowland rainshadow valleys (Fig. 7f), while related forests occur in the hinterland (Fig. 7e). Cool temperate dry grassy forests and woodlands and treeless grasslands (Fig. 7d) occupy the low relief rainshadow areas of the Monaro Tableland. Dry shrubby eucalypt forests are widespread in the coastal region and hinterland, but become more scattered on the tableland range and they are very rare in the rainshadow areas of lowland valleys and the tableland (Fig. 7c). Heathlands and scrubs are restricted to small areas on exposed coastal and tableland sites or specialised habitats in the hinterland such as riparian zones or rocky outcrops (Fig. 7i). Wetlands are also restricted to small patches, either in estuaries, on floodplains or broad headwater valleys in the southern coast and hinterland, and the eastern edge of the Monaro Tableland (Fig. 7h).

The predicted pre-1750 extent of floristic assemblages varies from more than 40 000 ha (map units 13, 15, 19 and 24) to less than 100 ha (units 1, 5, 51, 65, 66 and 69). The latter include rainforests, scrub on rocky outcrops and estuarine wetlands (Table 11). Habitat loss due to vegetation clearing has affected floristic assemblages unevenly. By 1994 some floristic assemblages had been depleted by more than 90%, while others remain at close to their original extent (Table 11). The floristic assemblages most depleted by clearing are in the Bega and Towamba valleys (18, 19, 20, 21, 39 & 40), on the Monaro Tableland (22A, 22B, 23A, 23B, 24 & 59) and along the coastal strip (36 & 60). The remaining area of these units is largely on private or leasehold land (Table 11). Reservation status was also highly biased (Table 11, Fig. 8). Floristic assemblages typically inhabiting steep, infertile terrain (e.g. map units 25, 49, 50, W1–W6) had high proportional reservation, while those found in low relief, fertile terrain had very low proportional reservation (e.g. 20, 21, 22A, 22B, 60).

Map validation

Qualitative checking revealed a number of mapping anomalies generated by the first iteration of decision rules. For example, some stands of map unit 58 (Swamp Forest) had initially been mapped along contours in the south-western part of the region. Comments on the field data sheets and our recollections from the field indicated that this type of vegetation occurs on flats along drainage lines. The anomaly was rectified by replacing maximum temperature and elevation with topographic roughness and wetness index in the appropriate decision rule. Other identified anomalies were similarly rectified.

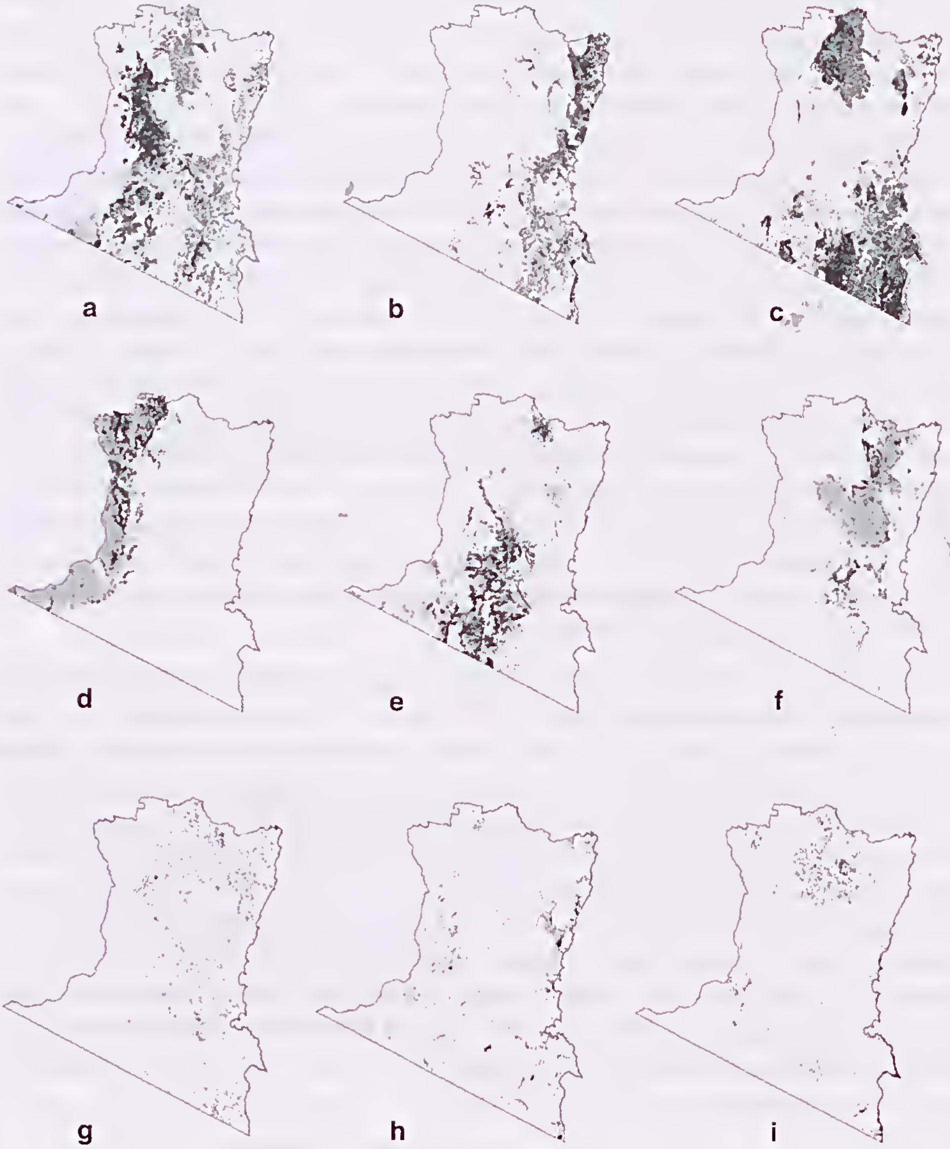

Fig. 7. Extant (black) and former (grey) distributions of a) mesic eucalypt forests (map units 9–17), b) intermediate dry forests (map units 2, 3, 32–34, 36, 37 and W6), c) dry shrubby forests (map units 25, 41–50, W1–W3 and W5), d) dry grassy tableland assemblages (map units 22–24 and W4), e) dry grassy hinterland forests (map units 26–31 and 35), f) dry grassy coastal valley forests (map units 18–21), g) rainforests (map units 1, 5–8), h) wetlands (map units 38–40, 57–60 and 63–70), and i) scrubs and heathlands (map units 4, 51–56, 61 and 62).

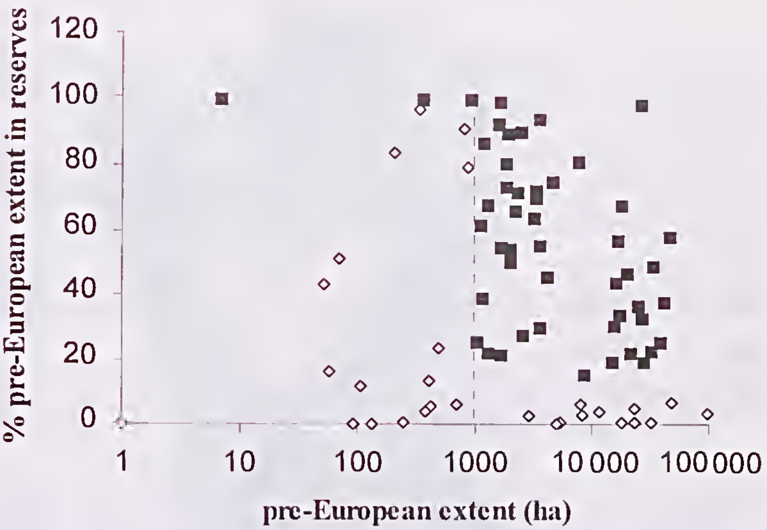

Fig. 8. Representation of map units in conservation reserves (Nature Reserves, National Parks and Flora Reserves). Broken line represents the JANIS (1996) threshold discriminating the general target for reservation of 15% of pre-european extent from the special target of 100% for rare units less than 1000 ha in pre-european extent. Open symbols show assemblages that do not meet relevant target, filled symbols show assemblages that do meet target.

Mean sampling density within a 5 km radius varied from less than 0.1 samples.km^{-2} extant native vegetation to more than 7 samples.km^{-2}. Sampling density was lowest (< 0.2 samples.km^{-2}) in: tableland remnants near Kybean and Craigie; inaccessable wilderness in the upper Brogo River catchment; and areas of State Forest south and north-east of Narrabarba, and in the upper Genoa River area adacent to the Victorian border (Fig. 9). The highest levels of sampling density (> 1 sample.km^{-2}) were in National Parks on the tableland range in the Coolangubra-Nalbaugh and upper Tantawangalo Creek areas, the Egan Peaks-Yowaka area west of Pambula; around Mt Waalimma near the Victorian border; and in privately owned remnant vegetation in the Bega valley (Fig. 9).

The 154 samples withheld from modelling for accuracy quantification represented map units 13, 14, 15, 31, 32, 33, 34, 37, 42, 46A, 46B, 47, 49, 53, 61, 62, W1 and W6. Overall map accuracy varied from 72% within 100 m to 96% within 1 km (Fig. 10). At the average spatial scale of planning units used in the Comprehensive Regional Assessment (100 ha forestry coupes and subcatchments), overall map accuracy was 93%. Thus, based on the 154 validation samples, there was a 93% chance that a planning unit selected to represent a particular map unit actually contained some of that map unit. Gains in accuracy increased at a decreasing rate with increasing neighbourhood size. The most accurately mapped assemblages included map units 35, 42, 53 and 61, while map unit 13 was the least accurately mapped. Many of the less widespread map units excluded from validation were modelled principally using aerial photograph interpreted spatial layers (e.g. rainforests, heaths, swamps). It was thus assumed that these units were mapped with reasonable reliability.

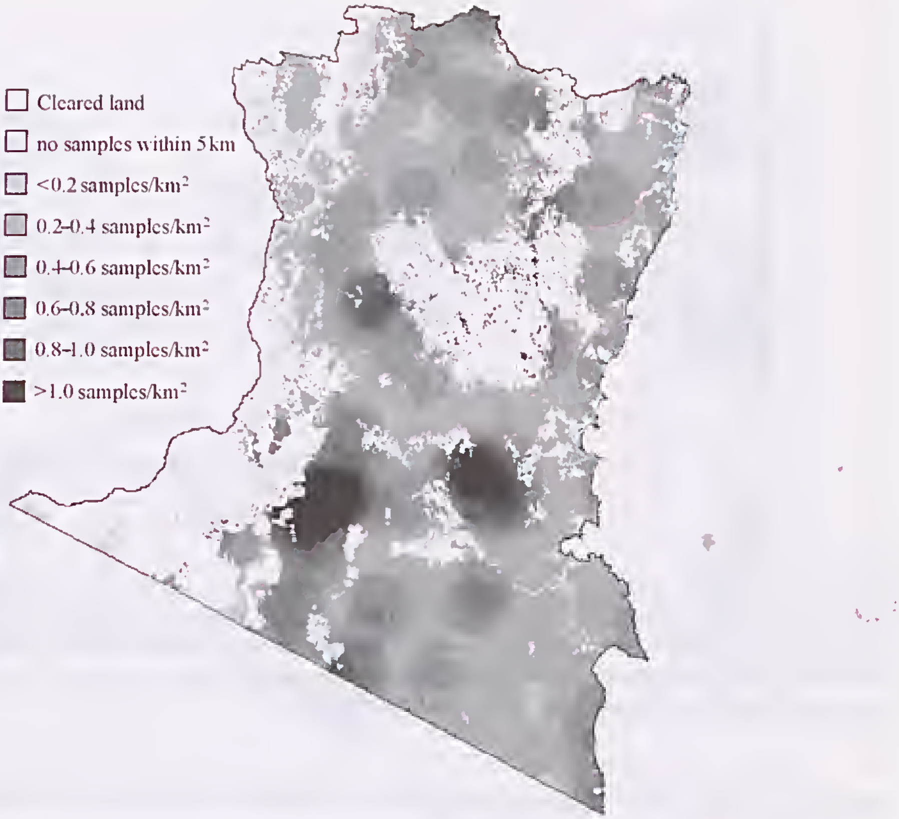

Fig. 9. Map reliability as represented by the mean number of samples per square kilometre of extant native vegetation within circular neighbourhoods of 5 km radius.

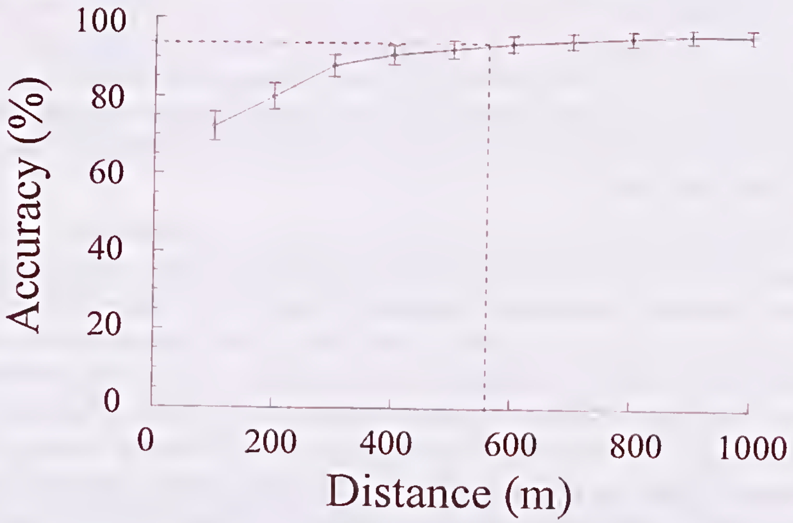

Fig. 10. Accuracy assessment of the vegetation map at varying spatial scales. Accuracy is the percentage of samples for which the floristic assemblage matched a mapped unit within varying distances of its location. Error bars are standard errors of the binomial distribution. Dotted line indicates the average spatial scale of planning units used in the Comprehensive Regional Assessment (100 ha).

Table 11. Pre-1750 extent of floristic map units, their depletion and representation on various land tenure classes as of 1st April 1999.

Floristic Assemblage	Pre1750 extent (ha)	Extant area 1994 (ha)	% depleted	National Parks & Nature Reserves (ha)	Flora Reserves (ha)	State Forest (ha)	State Forest plant-ation	Reserved Crown Land (ha)	Other Crown Land (ha)	Leased Crown Land (ha)	Private Land (ha)
1 Dry Rainforest	70	63	9	36	0	0	0	0	0	3	24
2 Myanba Dry Scrub Forest	334	334	0	323	0	0	0	0	0	0	10
3 Rocky Tops Dry Scrub Forest	1205	1205	0	1043	0	136	2	4	0	0	22
4 Acacia Scrub	3623	3585	1	3416	0	0	0	0	1	0	168
5 Bunga Head Rainforest	7	7	0	7	0	0	0	0	0	0	0
6 Coastal Warm Temperate RF	4160	4143	0	1910	169	1626	3	19	1	0	415
7 Hinterland Warm Temperate RF	1883	1878	0	1521	48	184	0	6	5	0	115
8 Cool Temperate Rainforest	874	844	3	696	20	94	0	0	0	1	35
9 High Mountain Wet Layered Forest	2267	1815	20	1489	124	131	0	0	8	0	63
10 Mountain Wet Layered Forest	20183	18091	10	9444	15	5138	32	148	21	245	3048
11 Tantawangalo Wet Shrub Forest	809	808	0	741	0	59	0	4	0	0	4
12 Mountain Wet Fern Forest	2322	2279	2	1666	22	508	8	12	0	1	64
13 Hinterland Wet Fern Forest	45986	43190	6	26677	555	8980	38	200	79	100	6562
14 Hinterland Wet Shrub Forest	27252	26169	4	8885	150	12860	0	364	74	17	3820
15 Mountain Wet Herb Forest	41575	30895	26	15612	560	10365	296	108	35	78	3841
16 Basalt Wet Herb Forest	14961	12263	18	3537	27	3100	149	104	39	295	5011
17 Flats Wet Herb Forest	3572	2949	17	1070	34	379	60	20	0	1	1385
18 Brogo Wet Vine Forest	8705	5046	42	1348	29	101	0	1	1	11	3555
19 Bega Wet Shrub Forest	48885	17959	63	3336	17	1026	133	37	31	37	13342

Table 11. cont.

Floristic Assemblage	**Pre1750 extent (ha)**	**Extant area 1994 (ha)**	**% depleted**	**National Parks & Nature Reserves (ha)**	**Flora Reserves (ha)**	**State Forest (ha)**	**State Forest plantation**	**Reserved Crown Land (ha)**	**Other Crown Land (ha)**	**Leased Crown Land (ha)**	**Private Land (ha)**
20 8ega Dry Grass Forest	32639	4429	86	275	0	20	25	27	3	12	4066
21 Candelo Dry Grass Forest	18015	1578	91	93	0	0	0	2	2	0	1481
22A Monaro Dry Grass Forest	11860	8222	31	527	0	17	0	88	5	643	6942
228 Numeralla Dry Shrub Woodland	5408	3611	33	1450	0	0	1	133	100	630	1298
23A Monaro Grassland	5096	311	94	0	0	0	0	0	0	1	310
23B Monaro Basalt Grass Woodland	23473	3395	86	109	0	82	234	107	0	32	2831
24 Subalpine Dry Shrub Forest	94924	26520	72	3589	8	1616	443	214	93	2546	18011
25 Sandstone Dry Shrub Forest	1140	821	28	697	28	95	0	0	0	0	0
26 Tableland Dry Shrub Forest	28011	16080	43	5424	284	6733	99	56	0	231	3252
27 Waalimma Dry Grass Forest	1324	1324	0	294	0	1031	0	0	0	0	0
28 Wog Wog Dry Grass Forest	1304	922	29	881	1	13	3	0	0	0	23
29 Nalbaugh Dry Grass Forest	2597	1937	25	711	2	875	78	3	0	12	256
30 Wallagaraugh Dry Grass Forest	1663	914	45	356	7	311	13	1	0	0	226
31 Hinterland Dry Grass Forest	33040	27700	16	16161	119	6275	281	113	0	50	4700
32 Coastal Foothills Dry Shrub Forest	24738	23614	5	9069	45	9123	0	729	147	25	4475
33 Coastal Range Dry Shrub Forest	16498	16336	1	9379	221	5614	19	15	32	5	1051
34 Coastal Gully Shrub Forest	17576	15289	13	5963	0	3913	0	201	109	46	5057
35 Escarpment Dry Grass Forest	38487	24423	37	9653	35	979	418	443	19	109	12768
36 Dune Dry Shrub Forest	1055	646	39	319	0	4	0	47	19	0	256
37 Lowland Gully Shrub Forest	15520	14685	5	4797	486	7699	0	81	21	6	1595

Floristic Assemblage	**Pre1750 extent (ha)**	**Extant area 1994 (ha)**	**% depleted**	**National Parks & Nature Reserves (ha)**	**Flora Reserves (ha)**	**State Forest (ha)**	**State Forest plant-ation**	**Reserved Crown Land (ha)**	**Other Crown Land (ha)**	**Leased Crown Land (ha)**	**Private Land (ha)**
38 Southern Riparian Scrub	490	441	10	116	168	42	9	0	0	0	106
39 Northern Riparian Scrub	693	447	35	44	0	2	6	0	2	2	393
40 Riverine Forest	249	197	21	1	0	1	0	0	0	0	195
41 Mountain Intermediate Shrub Forest	1878	1877	0	1376	196	243	0	3	0	6	54
42 Inland Intermediate Shrub Forest	21918	21429	2	4791	959	14952	1	11	22	2	692
43 Mountain Sandstone Shrub Forest	2497	2484	1	2249	17	63	0	0	0	0	154
44 Foothills Dry Shrub Forest	3337	3152	6	2322	28	689	67	0	0	0	45
45 Mountain Dry Shrub Forest	2040	1930	5	1023	71	464	17	0	0	1	354
46A Timbillica Dry Shrub Forest	22922	22797	1	1167	2345	18720	13	11	0	0	542
46B Lowland Dry Shrub Forest	16461	15428	6	7355	3	5165	8	447	100	0	2350
47 Eden Dry Shrub Forest	17892	17246	4	12145	250	3740	16	99	69	1	927
48 Mumbulla Dry Shrub Forest	4617	4576	1	3492	0	796	0	69	1	0	217
49 Coastal Dry Shrub Forest	32846	32240	2	7382	1063	20254	0	55	61	1	3423
50 Genoa Dry Shrub Forest	3697	3022	18	2037	37	737	11	0	0	1	200
51 Rhyolite Rock Scrub	51	51	0	22	19	7	0	0	0	0	3
52 Mountain Rock Scrub	202	202	0	170	17	9	1	0	0	0	6
53 Montane Heath	3248	3025	7	2391	0	3	19	60	10	121	420
54 Mt Nadgee Heath	371	371	0	371	0	0	0	0	0	0	0
55 Coastal Lowland Heath	1618	1582	2	1493	0	7	0	0	4	0	78
56 Hinterland Heath	385	385	0	16	68	286	0	0	0	0	15

Table 11. cont.

Floristic Assemblage	Pre1750 extent (ha)	Extant area 1994 (ha)	% depleted	National Parks & Nature Reserves (ha)	Flora Reserves (ha)	State Forest (ha)	State Forest plant-ation	Reserved Crown Land (ha)	Other Crown Land (ha)	Leased Crown Land (ha)	Private Land (ha)
57 Lowland Swamp	1662	1589	4	912	146	407	0	2	0	3	118
58 Swamp Forest	1190	1056	11	463	4	539	9	1	0	0	39
59 Sub-Alpine Bog	8188	1897	77	492	1	259	40	14	17	62	1013
60 Floodplain Wetlands	8537	2774	68	267	0	239	0	185	123	10	1951
61&62 Coastal Scrub & Beach Strand	2015	1358	33	1091	0	0	0	52	61	0	154
63 Estuarine Wetland Scrub	2970	956	68	123	0	15	0	55	21	3	738
64 Saltmarsh	411	295	28	62	0	4	0	33	49	15	133
65 River Mangrove	1	1	19	0	0	0	0	0	0	0	1
66 Grey Mangrove	92	60	35	13	0	1	0	1	0	0	45
67 Seagrass Meadow *(Halophila)*	108	108	-	13	0	3	0	0	0	0	15
68 Seagrass Meadow *(Posidonia)*	130	130	-	0	0	0	0	1	0	0	7
69 Seagrass Meadow *(Ruppia)*	56	56	-	10	0	2	0	0	0	0	20
70 Seagrass Meadow *(Zostera)*	423	423	-	24	0	5	0	4	1	0	74
W1 Wadbilliga Dry Shrub Forest	27347	27336	0	26913	0	65	0	0	109	39	211
W2 Wadbilliga Range Shrub Forest	933	933	0	933	0	0	0	0	0	0	0
W3 Wadbilliga Heath Forest	1683	1683	0	1671	0	0	0	0	0	2	10
W4 Kydra Flats Grass Forest	3386	3098	9	2434	0	106	0	48	51	108	350
W5 Wadbilliga Gorge Dry Forest	7938	7423	6	6446	0	3	0	0	6	0	968
W6 Wadbilliga River Valley Forest	1952	1947	0	1754	0	0	0	0	0	0	194
Total	809476	552284	32	246083	8398	156916	2554	4439	1550	5511	126295

Discussion

Biogeographic and environmental relationships of vegetation

The Eden region is centrally placed in Australia's unique eucalypt forest biome in a zone of climatic transition where subtropical and warm and cool temperate floras are juxtaposed (Beadle 1981, Keith & Sanders 1990). Subtropical elements of the regional flora are largely confined to a coastal strip extending north from Bega and represented on a continental scale by Nix's (1982) Torresian bioclimatic zone. The diminution of the subtropical flora with latitude is illustrated by numerous plant species, including many characteristic of rainforest habitats, reaching their southern limits of distribution in the Eden region (Keith 1990, Keith & Ashby 1992). Broad-scale latitudinal trends in species composition have been documented in both rainforests (Webb et al. 1984) and heathlands (Specht 1979). Turnover in eucalypt species composition occurs in relation to gradients of temperature and rainfall across south-east New South Wales (Austin et al. 1984).

The majority of the Eden region supports a temperate flora and is represented on a continental scale by Nix's (1982) Bassian bioclimatic zone, which becomes increasingly restricted to the tablelands further north. The temperate flora contains many plant taxa with southern Gondwanan origins (Keith & Sanders 1990). The cool temperate component of this flora is characterised by mesic elements strongly represented in floristic assemblages 8–17 and W4. Some widespread characteristic species include *Eucalyptus fastigata, E. obliqua, E. cypellocarpa, Bedfordia arborescens, Olearia argophylla, Blechnum nudum, Polystichum proliferum* and *Stellaria flaccida.* Their structural features include tall straight eucalypt dominants (except Cool Temperate Rainforest) and dense understories comprising various mixtures of ferns, mesophyllous shrubs and forbs. Subcanopies of small mesophyllous trees are essentially unique features of this group of assemblages. These mesic assemblages are widespread on elevated parts of the region that experience both high rainfall and cool temperatures (Fig. 7). Eight (map units 8–12, 15, 16 and W4) of these 11 mesic assemblages occur principally above 500 m elevation, while the two that are widespread below 400 m elevation (map units 13 and 14) are restricted to topographically sheltered sites in coastal and hinterland parts of the region.

A very different cool temperate flora inhabits elevated parts of the region that experience cool temperatures but low rainfall. This climatic regime typifies the Monaro Tableland, an extensive low-relief inclined plateau in a rainshadow that stretches from the escarpment range westward beyond the study area to the Australian alps (Costin 1954). The most widespread floristic assemblages here are dry grassy eucalypt forests and woodlands (map units 22–24, Fig. 7). Widespread characteristic species include *Eucalyptus pauciflora, E. dives, E. dalrympleana, E. viminalis, Poa sieberiana, Themeda australis* and *Asperula conferta.* Structurally these dry cool temperate assemblages comprise an open canopy of small eucalypts (except in Monaro Grassland) with an open or non-existent shrub stratum and continuous ground stratum dominated by grasses with interstitial herbs. Similar vegetation formations occupy elevated rainshadows of the Great Dividing Range as far north as the New England Tableland and south at lower elevations in Victoria and the Tasmanian midlands (e.g. Fensham 1989). All of these regions have been exploited for their pastoral resources.

A predominantly dry warm temperate flora dominates the coast and hinterland. The driest parts of this zone are the large rainshadow valleys of the Bega and Towamba Rivers, which are dominated by dry grassy eucalypt forests (map units 18–21). Widespread characteristic species include *Eucalyptus tereticornis, E. baueriana, E. melliodora, Eragrostis leptostachya, Dichanthium sericeum, Themeda australis* and *Desmodium brachypodum*. The dominant eucalypts may form a tall but open canopy above an open stratum of smaller *Acacia* trees. The shrub stratum is variable, but most developed on sites with either higher rainfall or greater topographic shelter (map units 18 and 19). A continuous cover of grasses and interstitial herbs dominates the ground stratum. Distance from the coast and cold air drainage result in low winter temperatures, even though summer maxima may be high. Consequently, some elements of the dry cool temperate flora (e.g. *E. pauciflora, E. dives*) occur sporadically in the coastal rainshadow valleys (e.g. near Candelo and Wolumla). Similar rainshadow valleys are scattered to the north (e.g. Araluen valley, Cumberland Plain, Hunter valley), although their occurrence is limited further south, with the Gippsland Lakes district being the most physiographically similar valley. All of these regions have also been exploited for their pastoral resources.

Beyond the rainshadow valleys, the coast and hinterland are dominated by a variety of shrubby eucalypt forests, although mesic eucalypt forests (map units 13 and 14) and warm temperate rainforests (units 6 and 7) occupy the most sheltered parts of the landscape. Typical widespread species of the warm temperate shrubby eucalypt forests include *Eucalyptus sieberi, E. globoidea, Corymbia gummifera, Platysace lanceolata, Epacris impressa, Leucopogon lanceolatus, Pultenaea daphnoides, Lepidosperma laterale* and *Lomandra multiflora*. Although all these assemblages share a sclerophyllous shrub stratum, their structural characteristics are variable. The tallest of the shrubby eucalypt forests (map units 32– 34, 37, 41, 42 and W2) occupy open gullies and less exposed slopes on the coastal ranges and hinterland. They may also occupy elevated sites on coastal ranges or mountain slopes where rainfall is high relative to most of the coast and hinterland. *Eucalyptus obliqua* and *E. muelleriana* are frequently among the most abundant canopy species with *E. sieberi*, while the shrub stratum may be dominated by Asteraceous and Fabaceous genera such as *Ozothamnus, Cassinia, Acacia, Daviesia* and *Pultenaea*. Ridges and more exposed slopes, especially on quartz-rich, low fertility substrates, support shorter forests dominated by *E. sieberi*, either in pure stands or with *E. agglomerata, E. consideniana, E. globoidea* or *C. gummifera*. Their prominent, open shrub strata are dominated by scleromorphs such as *Lomatia ilicifolia, Epacris impressa, Leucopogon lanceolatus, Podolobium ilicifolium* and *Platysace lanceolata* and a sparse groundcover of scleromorphic graminoids (map units 36, 43–50, W1, W3 and W5). Lower relief terrain in the hinterland supports dry eucalypt forest assemblages in which a grassy ground stratum may attain greater cover than the shrub strata (map units 25–31 and 35). Characteristic species here include *E. globoidea, E. maidenii, E. angophoroides, Poa meionectes, Senecio* sp. E and *Hibbertia obtusifolia*.

Variation in topography and soils superimposes local vegetation patterns on coarse scale climatic trends. The nutrient and moisture statuses of soils interact to produce complex environmental relationships with vegetation in the Eden region (Keith & Sanders 1990). Soil nutrient status varies between lithological substrates and across the catenary profile (Kelly & Turner 1978, Turner et al. 1978). Soil moisture varies with regional precipitation patterns, topographic exposure and terrain flows (Keith & Sanders 1990). In general, sheltered mesic sites with relatively high soil fertility support rainforest. Mesic eucalypt forests are found on moister, more fertile soils than sclerophyllous eucalypt forests, while sclerophyllous forests with grassy understories are generally associated with more fertile soils than those with shrub-dominated understories (Keith & Sanders 1990). These general relationships are well known in other parts of eastern Australia (e.g. Beadle 1954, Costin 1954, Keith 1994, Le Brocque & Buckney 1997).

Many of the region's floristic assemblages are restricted to localised habitats defined by specialised topographic and soil conditions. These include: rainforests restricted to relatively fertile soils in very sheltered gullies (map units 5–8) or upper slopes (map unit 1); riparian scrubs and forest restricted to narrow bands of river alluvium (map units 38–40); scrubs restricted to skeletal soils on rocky outcrops (map units 51 and 52); heathlands restricted to exposed slopes on quartz-rich low-fertility soils (map units 53–56); freshwater swamps restricted to periodically waterlogged soils (map units 57–60); scrub and grassland restricted to maritime sands (map units 61 and 62); and estuarine wetlands restricted to inter-tidal and sub-tidal zones (map units 63–70). Some vegetation patterns are related to the distribution of parent materials. For example, two of the mesic eucalypt forest assemblages (map units 13 and 14) are found in similar climatic and topographic habitats, but one is found primarily on granitoid substrates and the other is found primarily on metasedimentary substrates. Some parent materials support distinctive groups of floristic assemblages (e.g. map units 16, 22A and 22B are primarily restricted to basalt), while several assemblages have high fidelity to one type of parent material (e.g. map units 4, 51, 62).

Recurring landscape fires influence spatial patterns in vegetation through time. It seems likely that fires are at least partly responsible for the restriction of rainforest and related scrubs (map units 1–8) to small patches in the landscape (Floyd 1990). General models of the dynamics of temperate wet sclerophyll forests suggest several successional pathways are possible under alternative fire regimes, with fire exclusion eventually leading to rainforest development and high frequency fire regimes leading to the elimination of eucalypts and dominance of shrubs (Ashton 1981, Noble & Slatyer 1981). Models and empirical studies of heathland and upland swamps similarly suggest elimination of certain functional groups of plant species under sustained high and low frequency fire regimes, respectively (Keith 1991, Keith & Bradstock 1994, Bradstock et al. 1997). Shifts in floristic composition including local extinctions may occur in response to fire regimes. However, the spatial patterns in composition attributable to disturbance history are generally smaller than those attributable to physical environmental factors such as soil texture and moisture, at least in the short term (Bradstock et al. 1997).

Conservation

Eucalypt forests are physiognomically, structurally and floristically unique to Australia (Beadle 1981, Ovington 1983). Other temperate forested regions of the world support rainforests, deciduous forests or coniferous forests (Ovington 1983). The Eden region has a diverse range of eucalypt forests and is placed centrally in the east Australian eucalypt forest belt that spans 15° latitude from south-east Queensland to south-east Tasmania. Alpha species richness values for mesic and dry grassy eucalypt forests in Eden are among the highest in the world recorded for temperate forests (e.g. Whittaker & Woodwell 1969, Glen-Lewin 1975, Peet 1978, Kirkpatrick 1984, Cawe & McKenzie 1989, Wardell-Johnson et al. 1989, Fensham 1989). Sclerophyllous shrubby forests and heathlands exhibit intermediate species richness in the Eden region compared with those elsewhere (Whittaker 1979, Gimingham et al. 1979, George et al. 1979, Rice & Westoby 1983, Cowling 1983, Keith 1994). At landscape scale, the Eden region has a large native flora relative to forested regions of similar size at similar latitudes, but the flora is small compared to southern mediterranean regions and some eucalypt forests regions further north (Keith et al. 1999).

Threatening Processes

A range of threatening processes influence the conservation status of vegetation in the region (Appendix). These include habitat loss, certain disturbance regimes, overgrazing, nutrification, habitat degradation due to human misuse and feral animal activity. Continuing habitat loss due to clearing affects vegetation close to developing coastal resort centres, dry grassy eucalypt forests in agricultural zones and other forest assemblages on the margins of these zones. Clearing and subsequent land use change usually results in irreversible loss of native vegetation and is almost entirely restricted to private tenures. Small-scale clearing occurs on public land for the construction of public facilities and access. Although the rate of clearing has slowed substantially since the early 20th century, losses are spread unevenly (Table 11) and the continuing loss of small vegetation remnants in the region is reducing some types of vegetation to very small proportions of their original extent. Some regrowth of native vegetation has occurred in marginal agricultural districts, but there are few examples where such vegetation has attained a structure and composition that closely resembles uncleared vegetation. In concert with feral predators, continuing habitat loss is correlated with several regional extinctions of fauna (Lunney & Leary 1988).

Disturbance regimes involving fires and logging may threaten populations of certain species depending on how the timing and type of disturbance events interact with their life history (Whelan 1995, Williams et al. 1995, Keith 1996). Logging is not carried out in conservation reserves, but fires may occur across all land tenures. Rainforests are especially susceptible to intense wildfires which may result in major changes in structure and composition (Ashton & Frankenberg 1976, Floyd 1990) or elimination, as apparently occurred on Mt Darragh in 1942 (F. Carey pers. comm.). These effects may be exacerbated under higher fire frequency. In eucalypt forests, woodlands, scrubs and heathlands high frequency disturbance regimes may cause declines and local extinctions of some woody plant species. This effect is most conspicuous in species that depend on seed for regeneration (obligate seeders), but declines in resprouters may occur if high frequencies are sustained over several disturbance cycles (Keith 1996, Keith & Tozer 1997). Declines or elimination of certain eucalypts (particularly ashes) may occur if intervals between successive disturbances that kill standing trees are less than 20 years (Ashton 1981). Interactions between species, such as competitive effects of dense vegetative regrowth on seedling recruitment may exacerbate these effects. The existence of large stands of *Acacia dealbata* with sparse emergents of *Eucalyptus fastigata* and *E. nitens* near Nunnock River and Wog Wog Mountain lend tacit support for such fire effects within the region. Introduction of logging and associated soil disturbance and burning practices into the disturbance regime of production forests may cause additional effects (e.g. Dickinson & Kirkpatrick 1987). These disturbance regimes may result in increased relative abundance of fecund species such as *Eucalyptus sieberi* that establish rapidly and in greater numbers in exposed conditions relative to their competitors (Bridges 1983). Conversely, comparative studies on *Dicksonia antarctica* and associated epiphytes (Ough & Ross 1992) have shown that populations of other species may decline if plants are killed by logging treatments and require undisturbed conditions for establishment. Logging may also exacerbate the competitve elimination of some slower growing woody species, as their seedlings are deprived of light and perhaps other resources by fast-growing thicket-forming species such as some fern species and *Senecio linearifolius*. Although the densities of these opportunists may eventually decline, they may be replaced by taller, more persistent dense canopies such as *Bedfordia arborescens*. The role of these interactions in the failure of eucalypt regeneration in logged areas of mesic forest warrants further investigation.

Domestic cattle, sheep, feral and domestic goats and rabbits graze native vegetation, as do native herbivores. The impacts are likely to be greatest in remnants of grassland and dry grassy eucalypt forests and woodlands in and around the main pastoral districts (Bega and Towamba valleys and the Monaro Tableland). Grazing affects native plant species differentially according to interactions between their palatability, growth form and regeneration capacity. One of the most palatable native pasture species, *Themeda australis*, proliferates when grazing is excluded, particularly in response to summer rain, but may be eliminated under continued heavy grazing regimes (Vickery 1961). Forbs with erect growth forms are more prone to declines under grazing than those with rosette or prostrate growth forms, apparently because of the greater exposure of their buds to herbivory (McIntyre et al. 1995). However, grazing is one of several mechanisms that create gaps in grass canopies, which are an important requisite for seedling establishment in many species (Lunt 1991, Morgan 1997). These species may vary in the extent to which they exploit different kinds of gaps. In some cases this may provide opportunities for establishment of alien plant species, particularly if these are less palatable than native competitors. Nutrient enrichment, either through animal dung or direct pasture improvement may confer further advantages on alien species. Heavy grazing may exacerbate rates of soil erosion by increasing the exposure of soils to rainsplash and runoff as well as wind (Costin 1954). Such effects may be particularly evident after prolonged drought when regrowth capacity is diminished.

Nutrification may be associated with drift and runoff from pasture improvement or with more localised urban and rural developments. The impacts are usually expressed in the replacement of some native plant species with mesophyllous herbs, grasses and shrubs, many of which are introduced (e.g. Clements 1983). Scleromorphic shrubs are the most susceptible species to nutrification, either through direct toxicity effects or because they are eliminated by competitors with superior growth responses. Competitive relationships under varying nutrient regimes may also result in shifts in the relative abundance of native species. Groves et al. (1973), for example, found that *Poa labillardieri* showed a greater response to increased soil phosphorus and nitrogen than *Themeda australis*. The habitats most susceptible to nutrification include vegetation remnants in and around urban and rural developments and improved pastures, as well as riparian habitats and wetlands exposed to water runoff from these areas. Benson (1994), for example, observed higher levels of weed invasion along drainage lines in a *Poa labillardieri* tall tussock assemblage than in other Monaro grassland habitats.

Dumping and vandalism causes localised but significant habitat degradation near inhabited areas such as urban and rural centres and popular recreation sites. These threats are most significant for populations of rare plant species or floristic assemblages whose occurrences are concentrated in areas close to habitation (e.g. map units 36 and 61). Feral pigs are also associated with localised habitat degradation. Their intensive foraging activities cause major soil disturbance and varying levels of weed invasion, particularly in topographic flats in the south-west of the region. These sites support restricted floristic assemblages (map units 17, 30 and 58) and are likely to be important habitat resources for some native fauna. On parts of the Monaro Tableland, trampling by stock may have similar impacts on the soft organic soils of subalpine bogs (map unit 59).

Reservation and management

Management of conservation reserves is an important means of mitigating processes that threaten biodiversity. The reservation status of floristic assemblages was highly biased (Table 11, Fig. 8). Assemblages typically inhabiting steep, infertile terrain (e.g. map units 25, 41, 43, 47, 50, W1–W6) have more than two-thirds of their original extent represented in conservation reserves (Nature Reserves, National Parks and Flora Reserves). In contrast, assemblages found in low relief, fertile terrain have very low proportional reservation (e.g. Map Units 18, 19, 20, 21, 23A, 23B and 60). This kind of reservation bias has been demonstrated in other regions of New South Wales (Braithwaite et al. 1993, Pressey et al. 1996) and is apparently a world-wide phenomenon.

Many floristic assemblages have a relatively high proportion of their predicted pre-European occurrence represented in reserves. However, for assemblages with naturally restricted or highly depleted distributions, these proportions may amount to small areas and complete representation is considered a desireable goal for the conservation of biota within these units (JANIS 1996). Although a full appraisal of floristic assemblages in relation to criteria for a comprehensive, adequate and representative reserve system (JANIS 1996) is beyond the scope of this paper, two of the eight biodiversity conservation criteria are represented in Fig. 8. These criteria require that at least 15% of the pre-European extent of ecosystems be represented in reserves and that 100% of rare ecosystems (i.e. current area < 1000 ha) be represented in reserves. Nearly two-thirds of the map units currently meet these targets (Fig. 8). Most of those that do not are rare and some are below high tide mark, although a number of widespread assemblages (map units 18–24 and 60) have very low proportions (0–10%) of their distribution represented in reserves (Table 11). The poorly reserved assemblages are among the most species-rich in the region (Table 7), the most depleted by past clearing (Table 11) and the most threatened by continuing processes (Appendix). These features suggest that the conservation of map units 18–24 and 60 should be a very high priority. However, their fragmented distribution largely on freehold and leasehold lands and the degraded state of many stands impose substantial challenges for effective conservation. In some cases (e.g. map units 20, 21, 23A, 23B, 60), levels of depletion are so great that JANIS (1996) targets are unattainable unless an extensive restoration of cleared areas currently in production is implemented.

Acquisition of private lands for inclusion in the public reserve network will be limited by cost, but a high priority must be given to the few opportunities to formally reserve the most threatened assemblages. Although some significant unprotected stands of threatened assemblages remain adjacent to existing reserves, these stands are often transitional and do not represent the full range of variation within the respective units. Complementary off-reserve conservation measures are essential if loss and degradation of these vegetation types is to be mitigated. These measures include: community conservation projects; Voluntary Conservation Agreements (legally binding agreements between landholders and the state government to protect native habitat); private purchase and management of land for conservation; implementation of a regional vegetation management plan under the NSW Native Vegetation Management Act (1996); and declaration of critical habitat for threatened species and ecological communities under the NSW Threatened Species Conservation Act (1995). The last two mechanisms stem from recent legislation and are yet to be implemented in the Eden region. However, there has been evidence of progress on other measures since 1990. Recent examples include: the implementation of fauna and flora surveys in the Bega valley (Whelan & Hibberd 1992, Keith 1995); the operation of a vegetation management advisory service for farmers during 1995–1997 (J. Miles, pers. comm.); implementation of two Voluntary Conservation Agreements to protect stands of map units 19 and 21, respectively; and the purchase and management of a land parcel containing stands of map units 1 and 18 by the Bush Heritage Fund in 1996.

While protection from further habitat loss is a principal concern on private land, public land is largely exempt from clearing activities. Here, management of the disturbance regime is a major factor mediating the persistence of native plants and animals. On the public land estate most of the area outside reserves is managed for wood production. Within production forest there is a system of management zones that provide varying levels of protection from logging. In some of these zones (unproductive forest, scenic protection, flora protection, wildlife corridors and filter strips) logging is excluded or regulated at reduced intensity. Outside special management zones, protocols exist for the protection of certain habitats. Several naturally restricted floristic assemblages including some widely scattered in small stands are dependent on these measures to supplement low levels of representation in formal reserves (e.g. map units 17, 27, 30, 38 and 56), although in some cases the contribution is small. Within reserves, conservation is implemented primarily through the management of fire and visitor access, as well as rehabilitation works targeted at degraded locations.

Field identification of floristic assemblages

Floristic assemblages may be identified in the field by the co-occurrence of positive diagnostic species listed in the descriptions (Appendix). Positive diagnostic species are those that have high fidelity to a particular assemblage, i.e. high frequency and abundance relative to occurrences elsewhere (Table 4). Diagnostic species may be common or uncommon within their respective assemblages, but are always less common elsewhere. Examples include *Eucalyptus fraxinoides* and *E. ovata*, positive diagnostics for map units 41 and 58, respectively (Appendix). A species may be quite common in a particular assemblage, but may not be diagnostic of that unit if it is at least as common in several other units. These relatively ubiquitous species (e.g. *Eucalyptus sieberi, E. cypellocarpa*, Appendix) are less informative about the identity of a floristic assemblage at a given site.

The greater the number of diagnostic species identified in a particular stand, the more reliably a particular stand may be attributed to one of the floristic assemblages. The likelihood of membership of a stand to any given assemblage could be assessed statistically by using species frequency values to calculate the probability of finding a given combination of species in that assemblage. The probabilities of membership to alternative assemblages could thus be compared. If structural and habitat characteristics and stand location fall within the ranges specified for a particular assemblage (Appendix), this may be further evidence in support of a particular identification. Conversely, the presence of negative diagnostics and mismatches of other species, structural characteristics, habitat and distribution may be used to eliminate other possibilities from contention. Depending on available diagnostic species, definitive identification of vegetation at a given site may sometimes require sampling of full floristic composition and analysis with procedures such as those listed in Table 3. Although keys to floristic assemblages could be constructed (e.g. Outhred et al. 1985), we considered these to be inappropriate tools for field identification because they fail to consider variability within and between assemblages.

The continuous nature of variability in vegetation (Austin 1987) means that there will often be difficulty in assigning stands to classes, irrespective of how classes are defined. Furthermore, the classification and map of 79 vegetation units is a conservative representation of vegetation diversity for a coastal region of this size. Finer-scale analysis and recognition of more units at local scales could resolve some of the variability within units, particularly eucalypt forest assemblages. A finer-scale analysis will often be appropriate for assessments, planning and management of vegetation in local areas.

Map Accuracy

A range of factors is likely to influence the accuracy of the vegetation map. These include the comprehensiveness and evenness of sampling, characteristics of the vegetation classification, the accuracy of spatial data layers and the structure of the spatial model.

The comprehensiveness and evenness of sampling could be improved with additional sampling targeted at gaps (Table 1, Fig. 3, Fig. 9). The use of additional data from other surveys resulted in some areas being sampled at higher intensity than most other parts of the region. It may be expected that these areas are the most reliably mapped parts of the region (Fig. 9). Our recent sampling targeted at hitherto poorly surveyed areas (the Bega valley, Wallagaraugh catchment, Nungatta-upper Genoa area, Monaro Tableland and Numeralla area) would have improved map reliability and accuracy in those parts of the region. The least intensively sampled areas remaining include the dissected wilderness of the upper Brogo River (Wadbilliga National Park), parts of Nadgee, East Boyd and western Bondi State Forests, parts of the Monaro Tableland and a small part of the upper Towamba valley. However, notwithstanding possible refinements, the Eden region is now one of the most comprehensively surveyed regions in Australia and priorities for vegetation survey should lie elsewhere.

The characteristics of vegetation classifications should be driven largely by their purpose. Alternative vegetation classifications are possible, but it remains to be seen how different methods of classification and mapping affect the performance of alternative vegetation maps as surrogates for biodiversity. Nevertheless, the integration of quantitative field samples into the methodologies of both classification and mapping, and the relative stability of the classification since the earlier analysis by Keith & Sanders (1990) despite the inclusion of four times as many samples, suggest that the current classification and map are a robust representation of vegetation diversity in the region.

Inaccuracy in the spatial data layers may be responsible for some errors in vegetation mapping. During field work a number of small unmapped outcrops of various geological substrates (mainly basalt and metasediments) were discovered. While these were corrected on the digital substrate map before its use in modelling, other errors may await detection. Derived topographic variables such as slope, aspect, horizon azimuths (used in calculating radiation index) and wetness index are likely to deviate from field values more than raw altitude values because of their sensitivity to fine-scale topographic features. Climatic surfaces are possibly the least reliable of the spatial variables because of the sparse and uneven distribution of weather stations to calibrate predictions. Predicted mean temperatures and precipitation values are also sensitive to variation in observation periods between stations. Local climatic phenomena such as frost hollows may well have been under-represented in the climatic surfaces. We attempted to minimise these sources of error by using values from the spatial data layers to develop environmental relationships for mapping, rather than values measured or calculated from the field.

A wide range of models could be developed to provide an equally good fit to the sample data, but these may perform differently when evaluated against independent data. Procedures such as generalised linear models and generalised additive models have proved useful in the construction of distributional models for individual species (e.g. Austin et al. 1984, CSIRO 1996, Ferrier & Watson 1997, Elith et al. 1998). We chose a decision tree model structure because, although these may return slightly less accurate predictions from quantitative data, they have flexibility allowing the incorporation of qualitative expert knowledge into the mapping process. Arguably, alternative modelling approaches may have yielded a product of similar accuracy. Within a decision tree framework, many alternative structures offering a reasonable fit to the data are possible. With more time and more iterations in map checking, it may be possible to build a map that returns greater accuracy when evaluated against independent data.

The three approaches to map validation employed here (qualitative checking, description of map reliability and accuracy quantification) offer an overall measure of potential limitations discussed above. Qualitative checking is essential to correct the most simple and conspicuous inaccuracies that may arise in mapping. A description of map reliability alerts users to those areas subject to least survey effort, as well as providing some guidance for future sampling work. Accuracy quantification gives a minimal estimate of the likelihood that planning units of a given size actually contain a map unit that they may be selected to represent for some natural resource planning purpose. Validation is a much neglected component of mapping and is currently the subject of further research.

Acknowledgements

Fieldwork was carried out over a 12-year period with the assistance of Robyn Aitkin, David Albrecht, Elizabeth Ashby, Ross Bradstock, Nicholas Carlile, Michael Doherty, Annie Etheridge, Phil Gilmour, Tim Hager, Carole Helman, Meredith Henderson, Belinda Pellow, John Porter, Bob Pressey, Cathy Prideaux, Jackie Miles, Patsy Nagle, Jonathan Sanders, Dominic Sivertsen, Jonathan Smith, Heather Stone, Mark Tozer, Merin Tozer and Cathy Wilson. Use of data contributed by John Benson, Doug Binns, Steve Clark, Peter Clarke, John Dodson, Tim Fatchen and Bob Outhred is gratefully acknowledged. Jonathan Smith and Cathy Prideaux assisted with data analyses. 'Mr Ed' Knowles carried out the classification of Landsat image data and gave expert advice on GIS manipulation and chaff rumination. Mark Tozer expertly designed the map layout and implemented its production. Doug Binns, Phil Gilmour and Jackie Miles provided detailed comments on various aspects of the map. Jackie Miles, Peter Myerscough and Dominic Sivertsen commented on a draft manuscript. Work carried out by Jackie Miles for Bega Valley Catchment Management Committee assisted greatly with post-CRA map revision. NSW National Parks and Wildlife Service and the Resource and Conservation Assessment Council funded the work. We thank our families for their patience and tolerance.

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Manuscript accepted 7 January 1999

Appendix: Descriptive profiles of floristic assemblages.

Each profile includes data tables summarising floristic composition, vegetation structure and physical habitat, respectively. Floristic data are the frequency and cover-abundance (median with interquartile range in parentheses) of each species in samples of the map unit being described (target unit) and its frequency and abundance in all other samples (residual). Residual abundance statistics exclude zero values. Fidelity classes are defined in Table 4. Structural tables summarise the frequency of occurrence, height (in metres) and percentage projective cover of foliage and branches for each of four strata. Data are means with standard errors. Habitat tables summarise mean and interquartile range of predicted annual rainfall, altitude, field slope, and frequency of samples among substrate types and among terrain classes defined by slope and aspect (see Table 2).

Map Unit 1 Dry Rainforest

Dry rainforest is dominated by *Ficus rubiginosa* with occasional *Pittosporum undulatum* and *Brachychiton populneus*. The dense canopy is c. 10 m tall with occasional emergent eucalypts to 23 m. The sparse shrub stratum includes *Alectryon subcinereus, Notelaea venosa* and *Hymenanthera dentatum. Dendrocnide excelsa* and *Deeringia amaranthoides* may be locally common in the northern part of the range. The groundcover comprises scattered patches of erect herbs *Plectranthus graveolens and Sigesbeckia orientalis* with the fern *Pellaea falcata* var. *falcata* and grass *Oplismenus imbecillis* among rocks. Dry Rainforest is restricted to small patches generally less than 10 ha, usually on steep upper granite slopes or heads of gullies facing north at 200–400 m elevation. These patches occur between Cobargo and Bega, south of Candelo and in the upper Towamba valley. Generally these are fragmented landscapes on hilly fringes of grazing districts, although significant stands occur from Reedy Creek to Mt Pericoe in Coolangubra National Park. Dry Rainforest is likely to be highly sensitive to fire because the some of the dominant trees may be killed when burnt. Re-establishment relies upon seed dispersed by birds from unburnt sites. The understorey may be adversely affected by grazing (cattle, sheep and rabbits) in rural districts. Some of these stands may also be affected by small-scale clearing. This assemblage appears to be unique to the region, since *F. rubiginosa* reaches its southern limit here (Keith et al. 1999) and similarly restricted dry rainforests further north differ compositionally, particularly in the dominance of *Backhousia myrtifolia* (Austin 1978, Helman 1983). In East Gippsland, Woodgate et al. (1994) described a dry rainforest assemblage (Ecological Vegetation Class 34) dominated by *P. undulatum* with *Acmena smithii* and similar understorey elements to those recorded in Eden. Only 11 ha of this unit was mapped in the East Gippsland region.

Species richness: 28 ± 5 (0.04 ha)
Extant area: 63 ha
Proportion cleared: 9% (probably an underestimate)
Number of samples: 6

Table 1a. Diagnostic plant species of Map Unit 1.

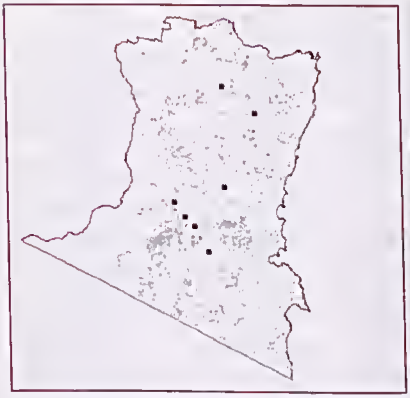
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Brachychiton populneus subsp. *populneus*	0.833	2(1–3)	0.02	1(1–1)	positive
Celastrus australis	0.833	3(2–3)	0.008	1(1–1)	positive
Ficus rubiginosa	1	5.5(5–6)	0.005	1.5(1–4)	positive
Geitonoplesium cymosum	1	2(2–2)	0.106	1(1–1)	positive
Notelaea venosa	0.5	3(1–3)	0.112	1(1–2)	positive
Pellaea falcata var. *falcata*	1	2(2–3)	0.094	1(1–2)	positive
Pittosporum undulatum	0.833	3(2–3)	0.089	1(1–2)	positive
Plectranthus graveolens	0.5	2(1–3)	0.009	1(1–2)	positive
Sigesbeckia orientalis	0.5	2(1–2)	0.076	1(1–2)	positive
Solanum aviculare	0.167	2(2–2)	0	0(0–0)	positive
Alectryon subcinereus	0.667	1(1–3)	0.005	1(1–2)	frequent
Asplenium flabellifolium	0.833	1(1–2)	0.119	1(1–2)	frequent
Clematis glycinoides	0.667	1.5(1–3)	0.113	1(1–2)	frequent
Dichondra repens	0.833	1(1–1)	0.282	2(1–2)	frequent
Hymenanthera dentata	1	1(1–2)	0.066	1(1–2)	frequent
Oplismenus imbecillis	0.667	1.5(1–2)	0.106	2(1–2)	frequent
Urtica incisa	0.667	1.5(1–2)	0.067	1(1–2)	frequent
Eucalyptus polyanthemos subsp. *vestita*	0.167	3(3–3)	0.012	2(2–3)	uninformative
Eucalyptus sieberi	0.167	1(1–1)	0.283	3(2–4)	uninformative
Eucalyptus tereticornis	0.333	2(1–3)	0.046	3(1–3)	uninformative
Lomandra longifolia	0	0(0–0)	0.551	2(1–2)	negative
Poa meionectes	0	0(0–0)	0.541	2(1–3)	negative
Pteridium esculentum	0	0(0–0)	0.579	2(1–3)	negative

Table 1b. Vegetation structure of Map Unit 1. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=6).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	50	23.0(2.4)	6(2)
Small tree	100	10.8(0.7)	80(5)
Shrub	100	1.7(0.3)	16(6)
Ground cover	100	0.3(0.0)	8(2)

Table 1c. Habitat characteristics of Map Unit 1. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		881	856–915	7
Altitude (m)		283	230–335	7
Slope (degrees)		34	31–37	7
Terrain class				
North	57			4
Intermediate	29			2
South	14			1
Flat	0			0
Parent material				
Devonian granitoids	71			5
Devonian high quartz sedimentaries	14			1
Ordovician high quartz sedimentaries	14			1



Map 1. Distribution of samples of Dry Rainforest (Map Unit 1) shown by large black squares. Samples of other map units shown as small grey points.

Plate 1. Dry Rainforest (Map Unit 1) dominated by *Ficus rubiginosa* and *Pittosporum undulatum* on the edge of paddocks near Verona, west of Cobargo.

Map Unit 2: Myanba Dry Scrub Forest

Myanba Dry Scrub Forest has an open stratum of *Eucalyptus bosistoana* and other eucalypts over a scrub stratum of *Ficus rubiginosa, Acacia falciformis, Cassinia* spp. and a range of other large shrub species. The understorey comprises a patchy cover of orchids *Dendrobium* spp., ferns *Asplenium* spp., *Pellaea falcata* and forbs *Stellaria flaccida* and *Urtica incisa* on and amongst rocks. Myanba Dry Scrub Forest is restricted to the steep dry rocky granite slopes of Myanba Creek gorge and the adjacent escarpment and appears to be unique to the region. This assemblage is entirely represented within Coolangubra National Park. Intense fires may reduce diversity, at least temporarily by eliminating figs and lithophytic orchids. Frequent low intensity fires could have a similar effect.

Species richness: 32 ± 3 (0.04 ha)
Extant area: 334 ha
Proportion cleared: 0%
Number of samples: 5

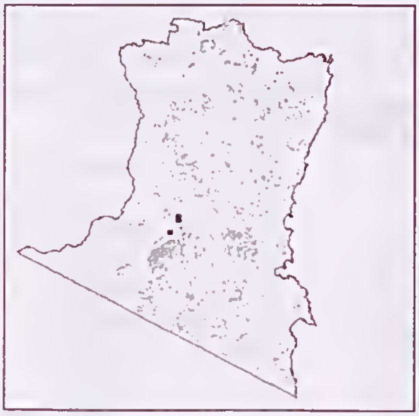
Table 2a. Diagnostic plant species of Map Unit 2.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Asplenium trichomanes subsp. *quadrivalens*	0.2	2(2–2)	0	0(0–0)	positive
Bulbine bulbosa	0.2	1(1–1)	0	0(0–0)	positive
Acacia falciformis	0.8	1(1–1)	0.188	2(1–3)	frequent
Asplenium flabellifolium	0.8	1(1–2)	0.119	1(1–2)	frequent
Cassinia aculeata	0.8	1(1–1)	0.161	1(1–2)	frequent
Cassinia trinerva	0.6	1(1–1)	0.082	1(1–3)	frequent
Dendrobium speciosum	0.6	1(1–2)	0.016	1(1–2)	frequent
Einadia nutans	0.8	1(1–1)	0.018	1(1–1)	frequent
Eucalyptus bosistoana	0.8	1(1–1)	0.05	2(1–3)	frequent
Ficus rubiginosa	0.6	1(1–3)	0.007	5(2–6)	frequent
Hymenanthera dentata	0.6	1(1–1)	0.068	1(1–2)	frequent

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Lepidosperma laterale	0.6	1(1–1)	0.344	1(1–2)	frequent
Notelaea venosa	0.6	1(1–1)	0.112	1(1–2)	frequent
Pandorea pandorana	0.8	1(1–2)	0.119	1(1–1)	frequent
Pellaea falcata var. *falcata*	0.8	1(1–1)	0.095	1(1–2)	frequent
Pimelea axiflora	0.8	1(1–2)	0.117	1(1–2)	frequent
Solanum pungentium	0.6	1(1–1)	0.061	1(1–1)	frequent
Stellaria flaccida	0.6	1(1–2)	0.21	1(1–2)	frequent
Thonandia longifolia	0.6	1(1–2)	0.074	1(1–2)	frequent
Urtica incisa	0.8	1(1–1)	0.067	1(1–2)	frequent
Eucalyptus cypellocarpa	0.2	1(1–1)	0.314	3(2–3)	uninformative
Eucalyptus elata	0.2	1(1–1)	0.113	3(2–3)	uninformative
Eucalyptus obliqua	0.2	1(1–1)	0.19	3(2–4)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.2	1(1–1)	0.012	2.5(2–3)	uninformative
Eucalyptus smithii	0.2	1(1–1)	0.045	2(1–3)	uninformative
Lomandra longifolia	0	0(1–0)	0.551	2(1–2)	negative
Poa meionectes	0.2	1(1–1)	0.54	2(1–3)	negative
Pteridium esculentum	0	0(1–0)	0.579	2(1–3)	negative

Table 2b. Habitat characteristics of Map Unit 2. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean Range	Interquartile	n
Annual rain (mm)		910	898–928	5
Altitude (m)		532	500–550	5
Slope (degrees)		45	45–45	1
Terrain class				
North	100			1
Intermediate	0			0
South	0			0
Flat	0			0
Parent material				
Devonian granitoids	100			5



Map 2. Distribution of samples of Myanba Dry Scrub Forest (Map Unit 2) shown by large black squares. Samples of other map units shown as small grey points.

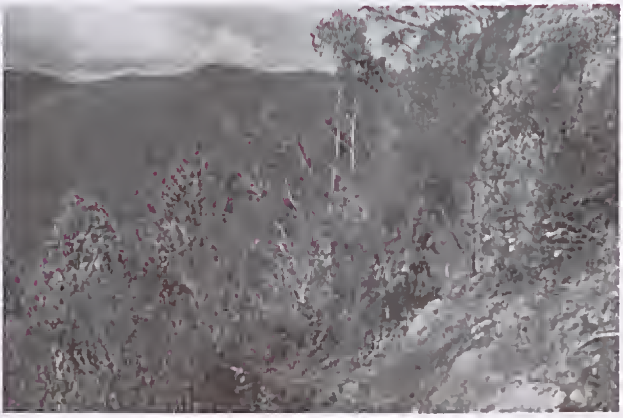


Plate 2. Myanba Dry Scrub Forest (Map Unit 2) with *Beyeria lasiocarpa, Dodonaea viscosa, Ficus rubiginosa* and *Pittosporum undulatum* amongst granitoid outcrops in Myanba Creek gorge, Coolangubra section of South East Forests National Park.

Map Unit 3: Rocky Tops Dry Scrub Forest

Rocky Tops Dry Scrub Forest is dominated by *Eucalyptus smithii* and other minor eucalypts in various combinations. It has a tall scrubby understorey with *Acacia falciformis, Beyeria lasiocarpa, Cassinia* spp., *Notelea venosa* and occasional rainforest elements such as *Ficus rubiginosa* and *Acmena smithii.* Its groundcover is sparse, but large rocks may be covered with *Dendrobium* spp. The tree canopy is open and c. 20 m tall , while small trees and shrubs may be arranged in one or two strata accounting for more than 50% cover. Typical habitat includes rocky slopes and ridgelines on granitoids and metasediments at intermediate elevations. Certain disturbance regimes that include frequent fire and logging may reduce diversity of the understorey. Although this assemblage may be restricted locally, stands are scattered over a wide distribution from Burragate Peak to Mt Imlay with an outlying stand on the slopes of Big Jack Mountain. Its occurrence seems unique to the region, with no similar assemblages known from adjacent regions (Austin 1978, Woodgate et al. 1994). The most similar assemblage nearby appears to be a variant of Rocky Outcrop Scrub (Ecological Vegetation Class 27 described by Woodgate et al. 1994) in gorges of East Gippsland (e.g. Snowy River, Brodribb River). Although this vegetation is dominated by *E. smithii* with *E. elata,* it lacks most of the sub-dominant trees and understorey species, particularly the mesic elements, recorded in the Eden region.
Species richness: 27 ± 3 (0.04 ha)
Extant area: 1205 ha
Proportion cleared: 0%
Number of samples: 13

Table 3a. Diagnostic plant species of Map Unit 3.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia falciformis	0.769	2.5(1–3)	0.184	2(1–3)	positive
Australopyrum pectinatum	0.077	1(1–1)	0	0(0–0)	positive
Beyeria lasiocarpa	0.923	3(1–4)	0.023	2(1–2)	positive
Cassinia longifolia	0.615	2(1–2)	0.184	1(1–3)	positive
Cassinia trinerva	0.615	2(1–3)	0.079	1(1–3)	positive
Eucalyptus smithii	0.769	2(1–3)	0.039	2(1–3)	positive
Geitonoplesium cymosum	0.692	2(1–2)	0.105	1(1–2)	positive
Haloragodendron baeuerlenii	0.077	1(1–1)	0	0(0–0)	positive
Notelaea venosa	0.846	2(1–3)	0.107	1(1–1)	positive
Pittosporum undulatum	0.769	1(1–2)	0.086	1(1–2)	frequent
Acmena smithii	0.154	2.5(2–3)	0.031	3(1–4)	uninformative
Brachychiton populneus subsp. *populneus*	0.077	3(3–3)	0.023	1(1–1)	uninformative
Eucalyptus agglomerata	0.385	3(1–3)	0.106	3(2–3)	uninformative
Eucalyptus bosistoana	0.077	1(1–1)	0.053	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.077	1(1–1)	0.316	3(2–3)	uninformative
Eucalyptus elata	0.231	2(2–3)	0.112	3(2–3)	uninformative
Eucalyptus maidenii	0.077	3(3–3)	0.063	3(2–3)	uninformative
Eucalyptus melliodora	0.077	3(3–3)	0.011	1.5(1–3)	uninformative
Eucalyptus muelleriana	0.077	1(1–1)	0.143	3(2–4)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.231	1(1–1)	0.012	2(2–3)	uninformative

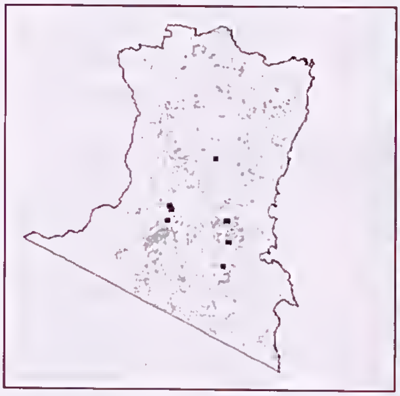
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Eucalyptus sieberi	0.154	2(2–2)	0.284	3(2–4)	uninformative
Ficus rubiginosa	0.077	1(1–1)	0.009	4(2–6)	uninformative
Lomandra longifolia	0.154	1(1–1)	0.552	2(1–2)	negative
Poa meionectes	0.231	1(1–1)	0.542	2(1–3)	negative
Pteridium esculentum	0.077	1(1–1)	0.581	2(1–3)	negative

Table 3b. Vegetation structure of Map Unit 3. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=7).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	20.0(1.1)	20(2)
Small tree	85.7	9.5(1.1)	20(5)
Shrub	85.7	3.3(0.4)	29(8)
Ground cover	85.7	0.7(0.1)	5(2)

Table 3c. Habitat characteristics of Map Unit 3. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≥ S°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > S° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		917	898–943	13
Altitude (m)		465	360–540	13
Slope (degrees)		30	23–38	13
Terrain class				
North	46			6
Intermediate	46			6
South	8			1
Flat	0			0
Parent material				
Devonian granitoids	46			6
Devonian high quartz sedimentaries	31			4
Low quartz sedimentaries	8			1
Ordovician high quartz sedimentaries	15			2



Map 3. Distribution of samples of Rocky Tops Dry Scrub Forest (Map Unit 3) shown by large black squares. Samples of other map units shown as small grey points.

Plate 3. Rocky Tops Dry Scrub Forest (Map Unit 3) with *Eucalyptus elata* and *E. sieberi* over a prominent shrub stratum of *Eriostemon trachyphyllus*, *Dodonaea viscosa* and *Olearia iodochroa* on the eastern upper slope of Big Jack Mountain, Coolangubra section of South East Forests National Park.

Map Unit 4: Acacia Scrub

Acacia Scrub is dominated by a dense canopy of *Acacia silvestris,* rarely with *A. mearnsii,* c. 15 m tall. The understorey is sparse and species-poor with shrubs of *Eriostemon trachyphyllus* and *Pomaderris brogoensis* and minimal groundcover. Other infrequent shrubs include *Prostanthera incisa* and *Beyeria lasiocarpa.* This assemblage occurs in small to moderate-sized patches at moderate elevations in steep gorges on metasediments in the Brogo River and Desert Creek catchments. Most stands are represented in Wadbilliga and Bemboka National Parks, although small stands occur on private and leasehold land at Brogo Pass and Alsops Creek gorge. Acacia Scrub is likely to be eliminated under frequent fire regimes because the dominant species is killed by fire and re-establishment is dependent on a soil seed bank which may take some years for post-fire replenishment. However, Acacia Scrub is unlikely to be readily flammable under moderate fire weather conditions. Long fire-free intervals may also be detrimental as standing plants and seed banks senesce. A large living individual of *A. silvestris* has been aged by ring counts in excess of 100 years (Clayton-Greene and Wimbush 1988). Regeneration of Acacia Scrub is apparently dependent on occasional, high intensity fires. Acacia Scrub extends just north of the study area to Wandella State Forest. Related scrubs are found in the Snowy River gorge to the south west (Clayton-Greene and Wimbush 1988, Forbes et al. 1982, Woodgate et al. 1994, Ecological Vegetation Class 27). Although these assemblages share *A. silvestris* and *E. trachyphyllus* with Acacia Scrub at Brogo, they lack *P. brogoensis* and include several additional *Acacia* spp. and other minor shrub species.

Species richness: 8 ± 2 (0.04 ha)
Extant area: 3585 ha
Proportion cleared: 1%
Number of samples: 13

Table 4a. Diagnostic plant species of Map Unit 4.

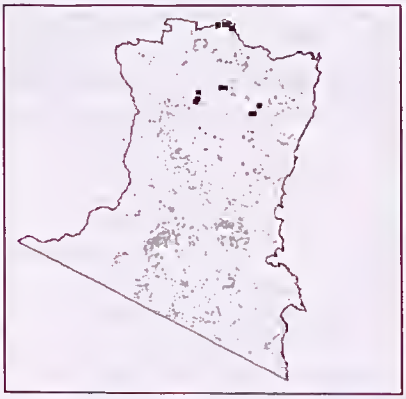
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia silvestris	1	5(4–5)	0.001	2.5(1–4)	positive
Eriostemon trachyphyllus	1	3(1–4)	0.007	1(1–2)	positive
Pomaderris brogoensis	1	3(1–4)	0.002	1(1–3)	positive
Hymenanthera dentata	0.667	1(1–1)	0.069	1(1–2)	frequent
Lomandra longifolia	0	0(1–0)	0.55	2(1–2)	negative
Poa meionectes	0	0(2–0)	0.54	2(1–3)	negative
Pteridium esculentum	0	0(2–0)	0.578	2(1–3)	negative

Table 4b. Vegetation structure of Map Unit 4. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=3).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	15.3(2.7)	65(3)
Small tree	100	7.0(0.6)	37(3)
Shrub	66.7	1.3(0.3)	21(19)
Ground cover	33.3	0.5(-)	1(-)

Table 4c. Habitat characteristics of Map Unit 4. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		940	923–962	13
Altitude (m)		402	310–500	13
Slope (degrees)		31	27–35	13
Terrain class				
North	38			5
Intermediate	54			7
South	8			1
Flat	0			0
Parent material				
Devonian high quartz sedimentaries	46			6
Low quartz sedimentaries	23			3
Ordovician high quartz sedimentaries	31			4



Map 4. Distribution of samples of Acacia Scrub (Map Unit 4) shown by large black squares. Samples of other map units shown as small grey points.

Plate 4. Acacia Scrub (Map Unit 4) dominated by *Acacia silvestris* with *Eriostemon trachyphyllus* and scant groundcover, off Bourkes Road, eastern Wadbilliga National Park.

Map Unit 5: Bunga Head Rainforest

Bunga Head Rainforest is dominated by a low (< 10 m) canopy of *Acmena smithii, Ficus rubiginosa* and *Pittosporum undulatum* and *Brachychiton populneus* with emergent *Eucalyptus botryoides*. Its understorey includes large shrubs of *Beyeria, Eupomatia* and *Notelaea*, a diverse range of vines (*Aphanopetalum, Eustrephus, Hibbertia, Marsdenia* and others), small ferns (*Asplenium, Pellaea*) and various graminoids (*Carex, Gahnia* spp., *Oplismenus*). It occurs at a single rocky site on rhyolite by the sea at Bunga Head within Mimosa Rocks National Park. The site is popular with tourists and may be threatened by degradation caused by overuse. Although not highly flammable, the site could be exposed to fires lit by visitors and diversity is likely to be lost if the stand was burnt. Floristic elements with subtropical affinities and high species richness possibly associated with its coastal location and unusual substrate make this assemblage unique in the region with affinities to rainforest assemblages further north (Floyd 1990).

Species richness: 47 (0.04 ha)

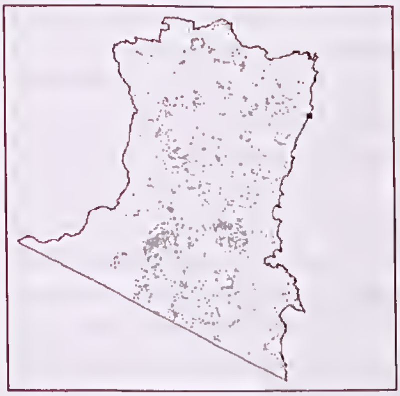
Extant area: 7 ha

Proportion cleared: 0%

Number of samples: 1

Table 5a. Diagnostic plant species of Map Unit 5.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acmena smithii	1	3(3–3)	0.031	3(1–4)	positive
Aphanopetalum resinosum	1	3(3–3)	0.009	2(1–3)	positive
Asplenium flabellifolium	1	2(2–2)	0.121	1(1–2)	positive
Beyeria lasiocarpa	1	3(3–3)	0.031	2(1–3)	positive
Carex appressa	1	2(2–2)	0.084	1(1–2)	positive
Cassytha phaeolasia	1	2(2–2)	0.045	1(1–2)	positive
Entolasia stricta	1	2(2–2)	0.181	1(1–2)	positive
Eupomatia laurina	1	3(3–3)	0.014	3(2–3)	positive
Eustrephus latifolius	1	2(2–2)	0.174	1(1–1)	positive
Ficus rubiginosa	1	4(4–4)	0.009	4(1–6)	positive
Gahnia aspera	1	2(2–2)	0.017	1(1–1)	positive
Gahnia melanocarpa	1	3(3–3)	0.074	1(1–2)	positive
Hibbertia dentata	1	2(2–2)	0.075	1(1–2)	positive
Marsdenia rostrata	1	2(2–2)	0.086	2(1–2)	positive
Notelaea longifolia	1	3(3–3)	0.001	1.5(1–2)	positive
Oplismenus imbecillis	1	2(2–2)	0.108	2(1–2)	positive
Pellaea falcata var. *falcata*	1	3(3–3)	0.097	1(1–2)	positive
Pittosporum undulatum	1	3(3–3)	0.091	1(1–2)	positive
Senecio linearifolius	1	2(2–2)	0.239	1(1–2)	positive
Smilax australis	1	2(2–2)	0.203	1(1–2)	positive
Themeda australis	1	2(2–2)	0.114	2(1–3)	positive
Pteridium esculentum	1	2(2–2)	0.577	2(1–3)	frequent
Lomandra longifolia	0	0(1–0)	0.549	2(1–2)	negative
Poa meionectes	0	0(2–0)	0.539	2(1–3)	negative



Map 5. Distribution of samples of Bunga Head Rainforest (Map Unit 5) shown by large black squares. Samples of other map units shown as small grey points.

Plate 5. Bunga Head Rainforest (Map Unit 5) with wind-pruned *Acmena smithii, Ficus rubiginosa, Myoporum acuminatum* and *Pittosporum undulatum* behind pebbly beach at Bunga Head, northern section Mimosa Rocks National Park.

Table 5b. Vegetation structure of Map Unit 5. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=1).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	0	-(-)	-(-)
Small tree	100	7.0(-)	75(-)
Shrub	100	1.5(-)	20(-)
Ground cover	100	0.3(-)	45(-)

Table 5c. Habitat characteristics of Map Unit 5. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		887	887–887	1
Altitude (m)		15	15–15	1
Slope (degrees)		12	12–12	1
Terrain class				
North	0			0
Intermediate	100			1
South	0			0
Flat	0			0
Parent material				
Devonian rhyolite	100			1

Map Unit 6: Coastal Warm Temperate Rainforest

Coastal Warm Temperate Rainforest is dominated by *Acmena smithii* and *Pittosporum undulatum*. Less frequent trees include *Doryphora sassafras, Polyscias murrayi, Acronychia oblongifolia* and others. *Doryphora* may be co-dominant in the northern part of the range. The dense canopy exceeds 15 m in height with emergent eucalypts over 20 m. There are numerous lianas such as *Marsdenia rostrata, Morinda jasminoides* and *Pandorea pandorana*, and sporadic epiphytes including *Korthalsella rubra* and *Sarcochilus* spp. *Eupomatia laurina, Cyathea* spp. and *Dicksonia antarctica* make up a prominent substratum 4 m tall, while a variable groundcover of ferns includes *Blechnum patersonii, Lastreopsis microsora, Microsorium scandens* and *Pteris umbrosa*. The groundcover is often more developed in southern stands. Restricted to steep sheltered gullies on metasedimentary substrates of the coastal ranges usually below 300 m elevation. Although small (usually < 20 ha), the stands are numerous and almost all occur in conservation reserves or State Forests. The topographically restricted distribution of rainforest patches reflect their susceptibility to fires. Even though *A. smithii* and some other species are capable of post-fire coppicing (Ashton and Frankenberg 1976), observations by Floyd (1990) indicate that post-fire recovery of both composition and structure is slow and that the resilience of these rainforests to repeated fires is likely to be poor. Diversity decreases with increasing latitude and altitude (Floyd 1990). Numerous species reach their southern limit within the region, particularly north of Bega (Keith 1990, Keith & Ashby 1992). Notwithstanding these trends, similar forests are found at low elevations to the north as far as Moruya (Helman 1983, Floyd 1990) and south in East Gippsland (Ecological Vegetation Class 32, Woodgate et al. 1994) and Wilsons Promontory (Floyd 1990).

Species richness: 31 ± 2 (0.04 ha)
Extant area: 4143 ha
Proportion cleared: 0%
Number of samples: 15

Table 6a. Diagnostic plant species of Map Unit 6.

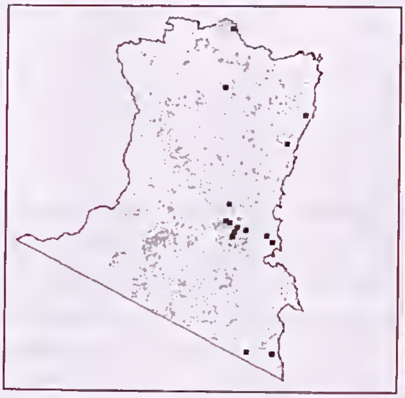
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acmena smithii	1	4(4–5)	0.023	2(1–4)	positive
Asplenium flabellifolium	0.539	2(2–2)	0.118	1(1–1)	positive
Blechnum patersonii	0.539	3(2–3)	0.006	1(1–2)	positive
Cissus hypoglauca	0.846	3(3–3)	0.016	1(1–2)	positive
Cyathea australis	0.846	3(2–3)	0.11	1(1–2)	positive
Cyathea leichhardtiana	0.077	4(4–4)	0	0(0–0)	positive
Dicksonia antarctica	0.539	3(3–3)	0.064	2(1–3)	positive
Eupomatia laurina	0.923	3(2–3)	0.007	2(1–3)	positive
Korthalsella rubra subsp. *rubra*	0.077	1(1–1)	0	0(0–0)	positive
Lastreopsis microsora	0.846	4(3–5)	0.007	2(1–3)	positive
Marsdenia rostrata	0.846	2(2–3)	0.08	1(1–2)	positive
Microsorum scandens	0.692	2(1–2)	0.006	3(2–4)	positive
Morinda jasminoides	0.769	2(1–2)	0.017	1(1–2)	positive
Pittosporum undulatum	0.692	2(1–3)	0.086	1(1–2)	positive
Plectorrhiza tridentata	0.077	2(2–2)	0	0(0–0)	positive
Pteris umbrosa	0.539	4(2–5)	0.008	3(2–4)	positive
Sarcochilus australis	0.077	1(1–1)	0	0(0–0)	positive
Smilax australis	0.846	2(2–3)	0.197	1(1–2)	positive
Tmesipteris parva	0.308	1(1–1)	0	0(0–0)	positive
Blechnum cartilagineum	0.923	1.5(1–3)	0.093	2(1–3)	frequent
Notelaea venosa	0.692	1(1–2)	0.108	1(1–1)	frequent
Olearia argophylla	0.615	1.5(1–3)	0.1	2(1–3)	frequent
Pandorea pandorana	0.846	1(1–2)	0.115	1(1–1)	frequent
Acacia melanoxylon	0.231	2(1–3)	0.104	1(1–3)	uninformative
Acacia subporosa	0.154	2.5(2–3)	0.003	1(1–2)	uninformative
Acronychia oblongifolia	0.154	1(1–1)	0.001	1(1–1)	uninformative
Alectryon subcinereus	0.077	2(2–2)	0.007	1(1–2)	uninformative
Backhousia myrtifolia	0.077	3(3–3)	0.002	1(1–4)	uninformative
Doryphora sassafras	0.231	4(3–4)	0.004	3(2–4)	uninformative
Elaeocarpus reticulatus	0.462	1(1–2)	0.073	1(1–2)	uninformative
Eucryphia moorei	0.154	4(3–5)	0.001	3.5(1–6)	uninformative
Pittosporum revolutum	0.154	1(1–1)	0.037	1(1–2)	uninformative
Polyscias murrayi	0.231	3(2–4)	0.001	1(1–1)	uninformative
Synoum glandulosum	0.154	3.5(3–4)	0.005	1(1–2)	uninformative
Lomandra longifolia	0.077	1(1–1)	0.553	2(1–2)	negative
Poa meionectes	0	0(2–0)	0.544	2(1–3)	negative
Pteridium esculentum	0	0(1–0)	0.582	2(1–3)	negative

Table 6b. Vegetation structure of Map Unit 6. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=11).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	0	-(-)	-(-)
Small tree	100	17.7(1.4)	72(6)
Shrub	100	4.0(0.4)	31(8)
Ground cover	100	0.9(0.1)	60(7)

Table 6c. Habitat characteristics of Map Unit 6. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		916	884–947	15
Altitude (m)		229	138–365	14
Slope (degrees)		14	6–19	14
Terrain class				
North	21			3
Intermediate	43			6
South	21			3
Flat	14			2
Parent material				
Devonian granitoids	20			3
Devonian high quartz sedimentaries	47			7
Low quartz sedimentaries	20			3
Ordovician high quartz sedimentaries	13			2



Map 6. Distribution of samples of Coastal Warm Temperate Rainforest (Map Unit 6) shown by large black squares. Samples of other map units shown as small grey points.

Plate 6. Coastal Warm Temperate Rainforest (Map Unit 6) dominated by *Acmena smithii* and *Pittosporum undulatum* festooned with *Cissus hypoglauca* and with emergent *Polyscias murrayi* on the highway north of Eden in Bellbird Creek Nature Reserve.

Map Unit 7: Hinterland Warm Temperate Rainforest

Hinterland Warm Temperate Rainforest is dominated by a canopy of *Acmena smithii* c. 15 m tall with emergent *Acacia melanoxylon* over 20 m tall. Other trees, with the exception of *Pittosporum undulatum* in some stands, are not common, although *Doryphora sassafras* and *Eucryphia moorei* may be locally common on the coastal ranges. Lianas include *Marsdenia rostrata, Pandorea pandorana* and *Smilax australis,* while epiphytes are rare. A prominent understorey of shrubs up to 4 m tall includes *Olearia argophylla, Coprosma quadrifida, Pomaderris aspera,* the tree ferns, *Cyathea australis* and *Dicksonia antarctica* and rarely *Elaeocarpus holopetalus.* A semi-continuous ground cover is dominated by ferns, notably *Blechnum cartilagineum, Lastreopsis microsora, Microsorium scandens, Polystichum proliferum, Pteris umbrosa* and the forb, *Australina* *pusilla.* Restricted to small patches generally less than 20 ha, in steep sheltered gullies on higher parts of the coastal ranges and in the foothills of the escarpment at 250–700 m elevation. The composition of this unit reflects its transitional status between Coastal Warm Temperate and Cool Temperate Rainforests (Map Units 6 and 8, respectively). Overlap occurs with the former on coastal ranges at Murrabrine and Yurammie and with the latter most notably at Werrinook where the largest stand of rainforest in the region grades from Hinterland Warm Temperate to Cool Temperate with increasing elevation on the escarpment. As for Coastal Warm Temperate Rainforest, almost all stands are in conservation reserves or State Forests and the principal threat is repeated and/or high intensity fires (Floyd 1990). Similar transitional rainforest occurs in gullies below Erinundra Plateau, the Howe and Murrungowar Ranges in East Gippsland, but these total less than 300 ha (Ecological Vegetation Class 33, Woodgate et al. 1994). Similar forests may also occur further north, but these may include additional components, notably *Eucryphia moorei* (Helman 1983, Floyd 1990).

Species richness: 28 ± 3 (0.04 ha)

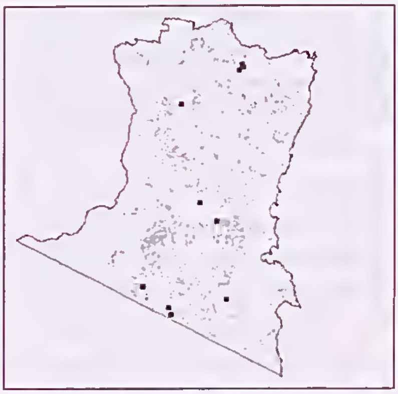
Extant area: 1878 ha

Proportion cleared: 0%

Number of samples: 10

Table 7a. Diagnostic plant species of Map Unit 7.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia melanoxylon	0.6	3(2–3)	0.102	1(1–3)	positive
Acmena smithii	1	4(4–5)	0.025	3(1–4)	positive
Asplenium australasicum	0.3	2(1–2)	0	0(0–0)	positive
Asplenium flabellifolium	0.7	2(1–2)	0.118	1(1–2)	positive
Blechnum cartilagineum	0.5	2(2–4)	0.097	2(1–3)	positive
Coprosma quadrifida	0.5	2(1–2)	0.244	1(1–2)	positive
Cyathea australis	0.9	3(2–3)	0.112	1(1–2)	positive
Dicksonia antarctica	0.7	3(2–4)	0.064	2(1–3)	positive
Lastreopsis microsora	0.6	2(2–3)	0.01	4(3–4)	positive
Marsdenia rostrata	0.9	2(2–2)	0.081	2(1–2)	positive
Microsorum scandens	0.7	3(2–4)	0.008	2(1–2)	positive
Olearia argophylla	0.9	2(2–3)	0.099	2(1–3)	positive
Pandorea pandorana	0.9	2(1–2)	0.116	1(1–1)	positive
Polystichum proliferum	0.7	3(2–4)	0.089	2(1–3)	positive
Pomaderris aspera	0.5	2(2–3)	0.159	2(1–3)	positive
Pteris umbrosa	0.8	4(2–5)	0.007	2(2–4)	positive
Pyrrosia rupestris	0.5	2(2–3)	0.019	1(1–2)	positive
Smilax australis	0.8	2(1–3)	0.199	1(1–2)	positive
Australina pusilla	0.6	1.5(1–2)	0.016	1(1–2)	frequent
Pellaea falcata var. falcata	0.6	1.5(1–2)	0.094	1(1–2)	frequent
Acronychia oblongifolia	0.1	1(1–1)	0.001	1(1–1)	uninformative
Doryphora sassafras	0.3	4(3–4)	0.004	3(2–4)	uninformative
Elaeocarpus holopetalus	0.3	1(1–3)	0.018	1(1–3)	uninformative
Pittosporum undulatum	0.4	1(1–3)	0.09	1(1–2)	uninformative
Lomandra longifolia	0	0(1–0)	0.553	2(1–2)	negative
Poa meionectes	0.1	2(2–2)	0.542	2(1–3)	negative
Pteridium esculentum	0	0(1–0)	0.581	2(1–3)	negative



Map 7. Distribution of samples of Hinterland Warm Temperate Rainforest (Map Unit 7) shown by large black squares. Samples of other map units shown as small grey points.

Plate 7. Hinterland Warm Temperate Rainforest (Map Unit 7) dominated by *Acmena smithii*, *Olearia argophylla* and *Acacia melanoxylon* with *Dicksonia antarctica* on Mt Darragh Road in Tantawangalo section of South East Forests National Park.

Table 7b. Vegetation structure of Map Unit 7. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=5).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	20	22.0(-)	20(-)
Small tree	100	16.4(1.4)	78(4)
Shrub	100	3.8(0.1)	33(8)
Ground cover	100	0.7(0.1)	70(8)

Table 7c. Habitat characteristics of Map Unit 7. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		966	895–1011	10
Altitude (m)		446	350–500	9
Slope (degrees)		16	10–21	5
Terrain class				
North	0			0
Intermediate	0			0
South	80			4
Flat	20			1
Parent material				
Devonian granitoids	80			8
Ordovician high quartz sedimentaries	20			2

Map Unit 8: Cool Temperate Rainforest

Cool Temperate Rainforest is dominated by a canopy of *Elaeocarpus holopetalus* over 20 m tall occasionally with *Acacia melanoxylon*. A small number of atypical stands are dominated by *Atherosperma moschatum* or *Eucryphia moorei*. Tall emergents of *Eucalyptus fastigata* are occasional. *Parsonsia brownii* is the only liana, while *Hymenophyllum* spp., *Grammitis billardieri, Tmesipteris* spp. and *Fieldia australis* are epiphytic on tree fern trunks. The tree fern *Dicksonia antarctica* dominates a prominent understorey 4 m tall with occasional shrubs of *Tasmannia lanceolata* and *Coprosma quadrifida*. Ferns, notably *Blechnum wattsii, Histiopteris incisa* and the forb, *Fieldia australis* dominate a prominent groundcover. Cool Temperate Rainforest is restricted to small patches generally less than 20 ha, in sheltered gullies on higher parts of the escarpment range above 700 m elevation. Outliers occur at this elevation below the summits of Burragate Peak and Mt Imlay. Most stands occur in conservation reserves, with a few in State Forest south of Brown Mountain. Stands of this rainforest may be eliminated by a single high intensity fire, since the dominant species is killed and relies on dispersal from unburnt stands for re-establishment (e.g. Noble & Slatyer 1981). Cool Temperate Rainforest was reportedly eliminated from Mt Darragh by an intense fire in 1942 (F. Carey, pers. comm.). The present vegetation of this site is Layered Brown Barrel Forest (Map Unit 10) with a single remnant individual of *E. holopetalus*. *Eucryphia moorei* is more common in Cool Temperate Rainforests further north (Helman 1983), while *A. moschatum* is more common in rainforests in East Gippsland (Ecological Vegetation Class 31, Woodgate et al. 1994). Although not surveyed, the bryophyte flora may be species-rich in the Eden cool temperate rainforests as it is in those of East Gippsland (Woodgate et al. 1994).

Species richness: 17 ± 2 (0.04 ha)
Extant area: 844 ha
Proportion cleared: 3%
Number of samples: 7

Table 8a. Diagnostic plant species of Map Unit 8.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Blechnum wattsii	1	4(4–5)	0.042	2(1–3)	positive
Dicksonia antarctica	1	5(3–5)	0.065	2(1–3)	positive
Elaeocarpus holopetalus	0.8	4.5(3–6)	0.017	1(1–2)	positive
Fieldia australis	0.6	3(1–3)	0.018	1.5(1–2)	positive
Grammitis billardieri	0.6	2(1–2)	0	0(0–0)	positive
Hymenophyllum flabellatum	0.2	1(1–1)	0	0(0–0)	positive
Hypolepis amaurorachis	0.2	1(1–1)	0	0(0–0)	positive
Tasmannia lanceolata	0.6	2(1–3)	0.042	2(1–3)	positive
Uncinia tenella	0.2	1(1–1)	0	0(0–0)	positive
Coprosma quadrifida	0.6	1(1–1)	0.245	1(1–2)	frequent
Gahnia sieberiana	0.6	1(1–3)	0.075	1(1–2)	frequent
Histiopteris incisa	0.8	1(1–3)	0.016	1(1–1)	frequent
Hymenophyllum cupressiforme	0.6	1(1–3)	0.01	1(1–2)	frequent
Parsonsia brownii	0.8	1.5(1–3)	0.025	1(1–2)	frequent
Acacia dealbata	0.4	2.5(0–3)	0.137	2(0–3)	uninformative
Acacia melanoxylon	0.2	3(3–3)	0.105	1(1–3)	uninformative
Atherosperma moschatum	0.2	4(4–4)	0.001	2(2–2)	uninformative

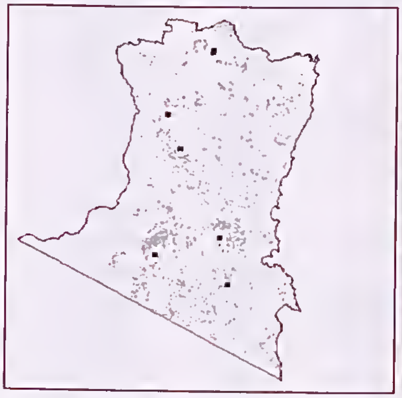
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Eucalyptus fastigata	0.2	3(3–3)	0.14	3(3–4)	uninformative
Eucryphia moorei	0.2	6(6–6)	0.002	3(1–5)	uninformative
Pittosporum bicolor	0.4	1(1–1)	0.007	1(1–1)	uninformative
Lomandra longifolia	0	0(1–0)	0.551	2(1–2)	negative
Poa meionectes	0	0(1–0)	0.541	2(1–3)	negative
Pteridium esculentum	0	0(1–0)	0.579	2(1–3)	negative

Table 8b. Vegetation structure of Map Unit 8. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=4).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	25	40.0(-)	10(-)
Small tree	100	23.5(1.7)	74(8)
Shrub	100	3.8(0.4)	35(12)
Ground cover	100	0.7(0.2)	48(16)

Table 8c. Habitat characteristics of Map Unit 8. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1041	911–1208	7
Altitude (m)		910	819–1038	7
Slope (degrees)		19	8–29	7
Terrain class				
North	0			0
Intermediate	43			3
South	29			2
Flat	29			2
Parent material				
Devonian granitoids	57			4
Devonian high quartz sedimentaries	14			1
Low quartz sedimentaries	29			2



Map 8. Distribution of samples of Cool Temperate Rainforest (Map Unit 8) shown by large black squares. Samples of other map units shown as small grey points.

Plate 8. Cool Temperate Rainforest (Map Unit 8) dominated by *Eucryphia moorei* with *Lastreopsis microsora* and other ferns below Burragate Peak, Yowaka section of South East Forests National Park.

Map Unit 9: High Mountain Wet Layered Forest

These forests dominated by *Eucalyptus nitens* and *E. fastigata* may exceed 60 m in height and commonly exceed 40 m. Northern stands may include *E. badjensis* and *E. fraxinoides* as minor components. A distinctive dense subcanopy of small trees c. 10 m tall includes *Acacia dealbata, Olearia argophylla* and *Prostanthera lasianthos.* Occasional vines include *Parsonsia brownii* and *Clematis aristata.* An understorey c. 3 m tall comprises *Dicksonia antarctica* and *Coprosma quadrifida.* The groundcover comprises scattered clumps of *Polystichum proliferum* and *Gahnia sieberiana* amongst typically dense leaf litter. These magnificent forests are scattered along the highest parts of the escarpment range above 850 m elevation, mainly on granitoid geology. Although the northern stands in the Brown Mountain–upper Tantawangalo area have been fragmented by recent logging, some of these are now reserved from further logging. In the south, a stand near the Victorian border was partially cleared for pine plantations in the 1970s (about one-fifth of the total area) and the remainder was burnt by an intense crown fire in 1983. Similar forests have been described on Erinundra Plateau in East Gippsland (Community 8.1, Forbes et al. 1982), but some differences are apparent including rainforest elements such as *Atherosperma moschatum* in the subcanopy and a greater frequency of shrubs (e.g. *Telopea oreades*) in the understorey. Although no detailed studies have been carried out on the dynamics of High Mountain Layered Wet Forest, it is likely that Ashton's (1981) stand-replacing fire model accurately describes vegetation change in relation to recurring disturbance (see also Noble and Slatyer 1981). The existence of stands dominated by *A. dealbata* south of Brown Mountain is consistent with the prior elimination of eucalypts as proposed in a pathway of Ashton's (1981) model that entails frequent fires. Although such fire regimes potentially threaten all reserved stands of Mountain Layered Wet Forest, these threats are likely to be amplified in stands that remain in production because they are subject to additional disturbances including tree-felling and management fires. Dense and rapid vegetative recovery of ferns that follows logging and regeneration burns may also suppress establishment of seedlings, reducing the diversity of woody species including trees.

Species richness: 21 ± 2 (0.04 ha)
Extant area: 1815 ha
Proportion cleared: 20%
Number of samples: 11

Table 9a. Diagnostic plant species of Map Unit 9.

Species	**Target frequency**	**Target C/A**	**Residual frequency**	**Residual C/A**	**Fidelity class**
Acacia dealbata	0.909	3.5(3–4)	0.132	2(1–3)	positive
Coprosma quadrifida	0.546	2(2–3)	0.244	1(1–2)	positive
Dicksonia antarctica	0.909	2.5(1–3)	0.062	2(1–3)	positive
Eucalyptus fastigata	0.636	3(3–5)	0.137	3(3–4)	positive
Eucalyptus nitens	0.727	4(3–4)	0.007	3(3–4)	positive
Olearia argophylla	1	4(3–4)	0.098	2(1–3)	positive
Parsonsia brownii	0.546	2(1–3)	0.023	1(1–2)	positive
Polystichum proliferum	0.818	3(2–5)	0.088	2(1–3)	positive
Prostanthera lasianthos	0.636	3(1–3)	0.06	1(1–2)	positive
Clematis aristata	0.818	1(1–1)	0.337	1(1–1)	frequent

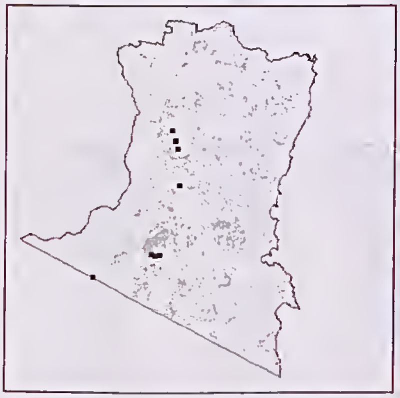
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Gahnia sieberiana	0.727	1.5(1–2)	0.072	1(1–3)	frequent
Acacia melanoxylon	0.182	2.5(2–3)	0.105	1(1–3)	uninformative
Elaeocarpus holopetalus	0.091	3(3–3)	0.019	1(1–3)	uninformative
Eucalyptus badjensis	0.182	3(3–3)	0.006	3(2–4)	uninformative
Eucalyptus elata	0.091	3(3–3)	0.113	3(2–3)	uninformative
Eucalyptus fraxinoides	0.091	4(4–4)	0.028	4(3–4)	uninformative
Eucalyptus obliqua	0.091	2(2–2)	0.19	3(2–4)	uninformative
Lomandra longifolia	0	0(1–0)	0.553	2(1–2)	negative
Poa meionectes	0	0(1–0)	0.543	2(1–3)	negative
Pteridium esculentum	0.455	1(1–2)	0.578	2(1–3)	negative

Table 9b. Vegetation structure of Map Unit 9. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=10).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	43.0(3.4)	45(4)
Small tree	100	9.8(1.8)	46(8)
Shrub	80	2.7(0.4)	25(6)
Ground cover	100	0.8(0.2)	35(9)

Table 9c. Habitat characteristics of Map Unit 9. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1063	916–1202	11
Altitude (m)		923	840–1000	11
Slope (degrees)		15	9–21	11
Terrain class				
North	18			2
Intermediate	18			2
South	64			7
Flat	0			0
Parent material				
Devonian granitoids	91			10
Ordovician high quartz sedimentaries	9			1



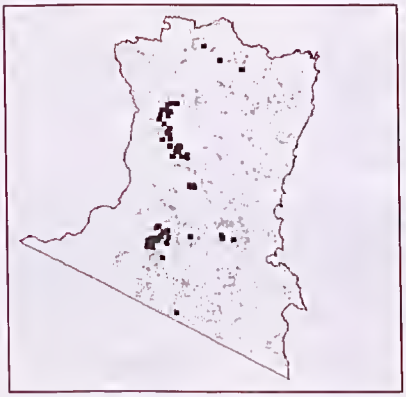
Map 9. Distribution of samples of High Mountain Wet Layered Forest (Map Unit 9) shown by large black squares. Samples of other map units shown as small grey points.

Plate 9. High Mountain Wet Layered Forest (Map Unit 9) with *Eucalyptus nitens* emergent over a subcanopy of *Acacia dealbata* and *Prostanthera lasianthos* on Obliqua Road in Glenbog State Forest.

Map Unit 10: Mountain Wet Layered Forest

Although structurally similar to the preceding assemblage (Map Unit 9), these forests exceeding 35 m in height are usually dominated by pure stands of *Eucalyptus fastigata* or may have a minor component of *E. cypellocarpa*. The principal subcanopy species are *Bedfordia arborescens, Olearia argophylla* and *Pomaderris aspera* and these typically reach a height of 10 m in high densities. The understorey is dominated by *Dicksonia antarctica* with *Coprosma quadrifida*, often tangled with *Smilax australis* and *Clematis aristata*, while the groundcover comprises ferns, *Polystichum proliferum* and *Pteridium esculentum*, and scattered herbs such as *Stellaria flaccida* and *Viola hederacea*. Mountain Wet Layered Forest typically occurs in large stands on moist granitoid slopes at 600–1000 m elevation (generally lower than Map Unit 9), although small unusual stands occur on metasediments and at lower elevation in sheltered gullies. The major stands occur on the escarpment range between Brown Mountain and the upper Tantawangalo Creek area, at Mt Darragh, in the upper Wog Wog River and on Egan Peaks. A similar model of vegetation dynamics is likely to apply to Mountain Wet Layered Forests as described previously for layered forests at higher elevation (Map Unit 9). Frequent disturbance regimes are therefore likely to entail similar adverse ecological consequences. Similar assemblages have not been explicitly described in adjacent regions. However, such vegetation may exist within wet sclerophyll complexes on Erinundra and Nunniong Plateaux in East Gippsland (Woodgate et al. 1994). For example, Mountain Wet Layered Forest in Eden shares some features of East Gippsland Community 8.1 and other features of 8.2 described by Forbes et al. (1982).

Species richness: 29 ± 1 (0.04 ha)
Extant area: 18 091 ha
Proportion cleared: 10%
Number of samples: 82



Map 10. Distribution of samples of Mountain Wet Layered Forest (Map Unit 10) shown by large black squares. Samples of other map units shown as small grey points.

Plate 10. Mountain Wet Layered Forest (Map Unit 10) dominated by *Eucalyptus fastigata* with a subcanopy of *Bedfordia arborescens* on the watershed between Wog Wog River and Basin Creek, Coolangubra section, South East Forests National Park.

Table 10a. Diagnostic plant species of Map Unit 10.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Bedfordia arborescens	0.8	3.5(3–4)	0.114	2(1–3)	positive
Coprosma quadrifida	0.825	2(1–2)	0.213	1(1–2)	positive
Dicksonia antarctica	0.525	2(1–3)	0.042	2(1–3)	positive
Eucalyptus fastigata	0.925	4(3–4)	0.096	3(2–4)	positive
Olearia argophylla	0.838	3(1–3)	0.063	1(1–3)	positive
Polystichum proliferum	0.763	3(1–3)	0.055	2(1–2)	positive
Pomaderris aspera	0.875	3(2–4)	0.121	1.5(1–3)	positive
Smilax australis	0.713	2(1–2)	0.174	1(1–2)	positive
Stellaria flaccida	0.638	2(1–2)	0.187	1(1–2)	positive
Pteridium esculentum	0.688	2(1–2)	0.57	2(1–3)	frequent
Clematis aristata	0.75	1(1–1)	0.318	1(1–1)	frequent
Viola hederacea subsp. *hederacea*	0.763	1(1–2)	0.419	2(1–2)	frequent
Acacia dealbata	0.45	3(2–4)	0.12	2(1–3)	uninformative
Acacia melanoxylon	0.363	1(1–3)	0.091	1(1–3)	uninformative
Eucalyptus badjensis	0.075	3.5(2–4)	0.004	3(2–4)	uninformative
Eucalyptus cypellocarpa	0.388	3(1–3)	0.31	3(2–3)	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.013	1(1–1)	0.019	3(1–3)	uninformative
Eucalyptus elata	0.038	2(1–2)	0.117	3(2–3)	uninformative
Eucalyptus fraxinoides	0.075	2.5(1–3)	0.026	4(3–4)	uninformative
Eucalyptus globoidea	0.025	1(1–1)	0.255	3(1–3)	uninformative
Eucalyptus maidenii	0.013	2(2–2)	0.066	3(2–3)	uninformative
Eucalyptus nitens	0.063	3(3–4)	0.009	4(3–4)	uninformative
Eucalyptus obliqua	0.1	1(1–2)	0.195	3(2–4)	uninformative
Eucalyptus radiata	0.013	3(3–3)	0.08	3(1–3)	uninformative
Eucalyptus sieberi	0.013	1(1–1)	0.298	3(2–4)	uninformative
Eucalyptus smithii	0.013	2(2–2)	0.047	2(1–3)	uninformative
Eucalyptus viminalis	0.025	2(1–3)	0.059	3(1–3)	uninformative
Lomandra longifolia	0.2	1(1–2)	0.569	2(1–2)	negative
Poa meionectes	0.288	1(1–2)	0.553	2(1–3)	negative

Table 10b. Vegetation structure of Map Unit 10. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=42).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	97.6	35.1(1.2)	38(3)
Small tree	100	10.2(0.5)	54(4)
Shrub	71.4	2.6(0.3)	25(4)
Ground cover	100	0.7(0.1)	40(3)

Table 10c. Habitat characteristics of Map Unit 10. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		973	911–1014	82
Altitude (m)		811	730–910	81
Slope (degrees)		11	5–15	78
Terrain class				
North	4			3
Intermediate	35			27

South	38	30
Flat	23	18
Parent material		
Devonian granitoids	84	69
Devonian high quartz sedimentaries	4	3
Low quartz sedimentaries	1	1
Tertiary Basalt	11	9

Map Unit 11: Tantawangalo Wet Shrub Forest

Tantawangalo Wet Shrub Forest is a tall forest dominated by *Eucalyptus obliqua, E. cypellocarpa* and *E. fastigata.* Its prominent and diverse shrub stratum distinguishes it from other wet eucalypt forest assemblages. Typical species include *Tasmannia lanceolata, Acacia melanoxylon, Bedfordia arborescens, Pomaderris aspera* and *Hakea eriantha.* The understorey is dominated by *Dicksonia antarctica* with *Coprosma quadrifida,* often tangled with *Billardiera scandens, Clematis aristata, Smilax australis* and *Tylophora barbata.* The groundcover is dominated by graminoids and lilioids such as *Gahnia sieberiana, Dianella tasmanica* and *Lepidosperma laterale.* This distinctive forest assemblage is restricted to the upper Tantawangalo Creek area on moderate granitoid slopes at 800–1000 m elevation. Almost all occurrences are represented within South East Forests National Park. While there are no immediate threats, diversity of the shrubby understorey may be reduced if fire frequency increases significantly in future. There are apparently no similar forest assemblages outside the Eden region (Costin 1954, Austin 1978, Forbes et al. 1982, Woodgate et al. 1994).

Species richness: 31 ± 1 (0.04 ha)
Extant area: 808 ha
Proportion cleared: 0%
Number of samples: 18

Table 11a. Diagnostic plant species of Map Unit 11.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia melanoxylon	0.778	4(3–4)	0.097	1(1–2)	positive
Bedfordia arborescens	0.611	3(2–3)	0.145	2(1–4)	positive
Eucalyptus cypellocarpa	0.944	3(3–4)	0.306	3(2–3)	positive
Eucalyptus fastigata	0.833	4(4–4)	0.132	3(3–4)	positive
Eucalyptus obliqua	0.944	4(3–5)	0.18	3(2–4)	positive
Gahnia sieberiana	0.722	3(1–3)	0.069	1(1–2)	positive
Pomaderris aspera	0.667	3(1–3)	0.155	2(1–3)	positive
Tasmannia lanceolata	1	3(1–3)	0.032	1.5(1–3)	positive
Billardiera scandens	0.833	1(1–1)	0.323	1(1–1)	frequent
Clematis aristata	0.944	1(1–1)	0.334	1(1–1)	frequent
Coprosma quadrifida	0.889	1(1–1)	0.238	1(1–2)	frequent
Dianella tasmanica	0.722	1(1–1)	0.229	1(1–2)	frequent
Gonocarpus teucrioides	0.722	1(1–1)	0.311	2(1–2)	frequent
Goodenia ovata	0.722	1(1–3)	0.166	2(1–2)	frequent
Hakea eriantha	0.667	1(1–3)	0.059	1(1–2)	frequent
Lepidosperma laterale	0.722	1(1–3)	0.34	1(1–2)	frequent
Leucopogon lanceolatus var. *lanceolatus*	0.611	1(1–1)	0.403	1(1–2)	frequent
Olearia argophylla	0.722	1(1–2)	0.097	2(1–3)	frequent
Smilax australis	0.889	1(1–1)	0.195	1(1–2)	frequent
Tylophora barbata	0.667	1(1–1)	0.262	2(1–2)	frequent

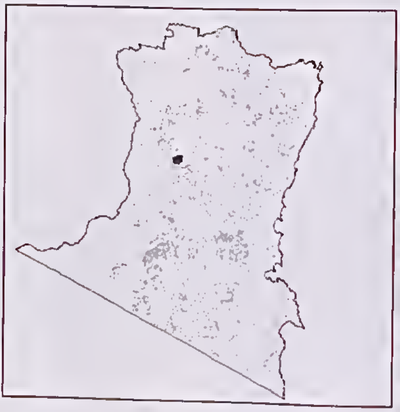
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Viola hederacea subsp. *hederacea*	1	1(1–1)	0.431	2(1–2)	frequent
Acacia dealbata	0.278	1(1–3)	0.136	2(1–3)	uninformative
Elaeocarpus holopetalus	0.556	1(1–1)	0.013	2(1–3)	uninformative
Eucalyptus elata	0.278	3(2–3)	0.111	3(2–3)	uninformative
Eucalyptus radiata	0.222	3(2–4)	0.075	3(1–3)	uninformative
Eucalyptus sieberi	0.167	3(3–5)	0.284	3(2–4)	uninformative
Lomandra longifolia	0.889	1(1–1)	0.545	2(1–2)	negative
Poa meionectes	0.556	1(1–1)	0.539	2(1–3)	negative
Pteridium esculentum	1	1(1–1)	0.572	2(1–3)	negative

Table 11b. Vegetation structure of Map Unit 11. Frequency is the proportion of samples in which strata were present. Height data are unavailable. Cover data are means with standard errors in parentheses (n=18).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	-	39(2)
Small tree	88.9	-	19(3)
Shrub	100	-	33(3)
Ground cover	100	-	25(2)

Table 11c. Habitat characteristics of Map Unit 11. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		957	952–960	18
Altitude (m)		890	865–908	1
Slope (degrees)		6–10	18	
Terrain class				
North	33			6
Intermediate	22			4
South	22			4
Flat	22			4
Parent material				
Devonian granitoids	100			18



Map 11. Distribution of samples of Tantawangalo Wet Shrub Forest (Map Unit 11) shown by large black squares. Samples of other map units shown as small grey points.

Plate 11. Tantawangalo Wet Shrub Forest (Map Unit 11) dominated by *Eucalyptus cypellocarpa* with *E. fastigata* over an open stratum of *Bedfordia arborescens*, *Exocarpos strictus* and *Olearia argophylla* on Robinsons Road in the upper Tantawangalo Creek catchment, Tantawangalo section of South East Forests National Park.

Map Unit 12: Mountain Wet Fern Forest

Mountain Wet Fern Forest is dominated by *Eucalyptus fastigata* and *E. cypellocarpa* exceeding 32 m in height. Tree ferns *Cyathea australis* and tall shrubs of *Bedfordia arborescens* sometimes form an open stratum c. 10 m tall, while scattered shrubs of *Coprosma quadrifida, Pimelea axiflora* and *Senecio linearifolius* emerge from a prominent groundcover of ferns *Blechnum nudum* and *Pteridium esculentum.* Interstitial herbs of the ground stratum include *Geranium potentilloides, Stellaria flaccida* and *Viola hederacea.* The vines *Tylophora barbata* and *Smilax australis,* and the grass *Hierochloe rariflora* trail amongst groundcover ferns. Mountain Wet Fern Forest occurs on steep sheltered granitoid slopes at 450–900 m elevation on the escarpment range and outlying mountains such as Egan Peaks and Mt Poole. Mountain Wet Fern Forest is most similar to Mountain Wet Layered Forest (Map Unit 10), but differs in the presence of minor tree species and greater abundance of *E. cypellocarpa,* its more open subcanopy and in the composition and greater diversity of its understorey. The diversity of this assemblage may be affected by regimes of frequent and/or intense disturbances (i.e. fires and logging). Dense and rapid vegetative recovery of ferns that follows logging and regeneration burns may suppress establishment of seedlings, reducing the diversity of woody species including trees. Frequent burning is likely to exacerbate this effect, although these threats are not ubiquitous in Mountain Wet Fern Forest, since about two-thirds of its extent is represented within conservation reserves. Similar assemblages may exist in the wet forest complex of East Gippsland (Ecological Vegetation Class 30, Woodgate et al. 1994), but this needs further investigation.

Species richness: 33 ± 2 (0.04 ha)
Extant area: 2279 ha
Proportion cleared: 2%
Number of samples: 31

Table 12a. Diagnostic plant species of Map Unit 12.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Bedfordia arborescens	0.677	2(2–4)	0.14	2(1–3)	positive
Blechnum nudum	0.613	4(3–5)	0.068	2(1–3)	positive
Coprosma quadrifida	0.742	2(1–2)	0.235	1(1–2)	positive
Cyathea australis	0.548	3(2–3)	0.108	1(1–2)	positive
Eucalyptus cypellocarpa	0.903	3(3–4)	0.301	3(2–3)	positive
Eucalyptus fastigata	0.807	3(3–4)	0.126	3(3–4)	positive
Geranium potentilloides	0.807	2(1–2)	0.203	1(1–2)	positive
Hierochloe rariflora	0.613	2(2–3)	0.173	2(1–3)	positive
Pimelea axiflora	0.71	2(1–2)	0.106	1(1–2)	positive
Senecio linearifolius	0.613	2(1–2)	0.232	1(1–2)	positive
Stellaria flaccida	0.839	2(1–2)	0.198	1(1–2)	positive
Tylophora barbata	0.839	2(1–2)	0.255	2(1–2)	positive
Viola hederacea subsp. *hederacea*	0.871	2(1–2)	0.428	2(1–2)	positive
Poa meionectes	0.613	2(1–3)	0.537	2(1–3)	frequent
Pteridium esculentum	1	2(2–4)	0.568	2(1–3)	frequent
Hydrocotyle acutiloba	0.645	1(1–2)	0.187	1(1–2)	frequent
Smilax australis	0.807	1(1–2)	0.19	1(1–2)	frequent
Acacia melanoxylon	0.258	2(1–3)	0.102	1(1–3)	uninformative
Eucalyptus badjensis	0.032	5(5–5)	0.007	3(2–4)	uninformative
Eucalyptus croajingolensis	0.032	2(2–2)	0.002	3(2–3)	uninformative

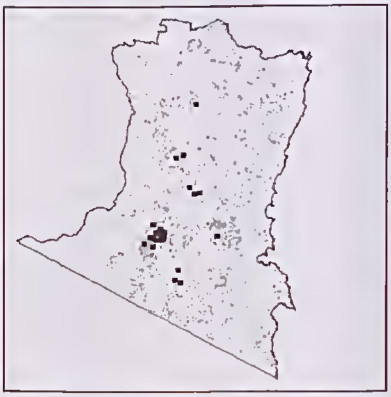
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Eucalyptus elata	0.129	4(3–4)	0.112	3(2–3)	uninformative
Eucalyptus globoidea	0.065	1.5(1–2)	0.246	3(1–3)	uninformative
Eucalyptus muelleriana	0.032	3(3–3)	0.144	3(2–4)	uninformative
Eucalyptus obliqua	0.387	2(1–3)	0.185	3(2–4)	uninformative
Eucalyptus radiata	0.097	2(2–3)	0.076	3(1–3)	uninformative
Eucalyptus sieberi	0.032	1(1–1)	0.288	3(2–4)	uninformative
Lomandra longifolia	0.29	1(1–2)	0.555	2(1–2)	negative

Table 12b. Vegetation structure of Map Unit 12. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=25).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	33.1(1.5)	45(3)
Small tree	64	9.9(1.9)	34(7)
Shrub	96	2.9(0.3)	22(4)
Ground cover	100	1.0(0.1)	59(6)

Table 12c. Habitat characteristics of Map Unit 12. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1018	996–1039	3
Altitude (m)		695	660–763	31
Slope (degrees)		15	5–26	31
Terrain class				
North	6			2
Intermediate	35			11
South	45			14
Flat	13			4
Parent material				
Devonian granitoids	94			29
Ordovician high quartz sedimentaries	6			2

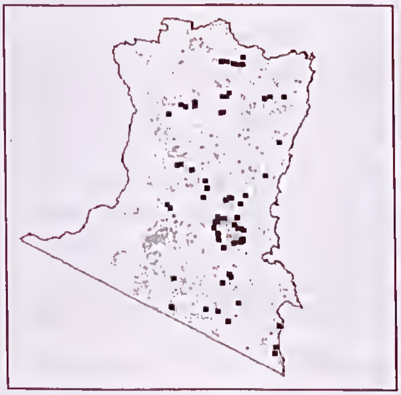


Map 12. Distribution of samples of Mountain Wet Fern Forest (Map Unit 12) shown by large black squares. Samples of other map units shown as small grey points.

Plate 12. Mountain Wet Fern Forest (Map Unit 12) dominated by *Eucalyptus fastigata* with a dense groundcover of *Blechnum nudum* near Mt Darragh, Tantawangalo section of South East Forests National Park.

Map Unit 13: Hinterland Wet Fern Forest

Hinterland Wet Fern Forest is a diverse mesic assemblage dominated by *Eucalyptus cypellocarpa* and numerous less frequent tree species over 30 m tall. One or two open strata of shrubs c. 2–9 m tall include *Pomaderris aspera* and several less frequent species. The dense groundcover is dominated by ferns, *Calochlaena dubia, Blechnum cartilagineum, Doodia aspera* and *Pteridium esculentum.* Herbs including *Desmodium varians, Stellaria flaccida* and *Viola hederacea* and the grass *Poa meionectes* are common amongst the large clumps of ferns. Vines growing amongst the groundcover and shrubs include *Tylophora barbata, Smilax australis, Eustrephus latifolius* and *Glycine clandestina.* Hinterland Wet Fern Forest is widespread in gullies and moist sheltered slopes in relatively large stands below 800 m elevation. In the higher part of its altitudinal range it is replaced by Mountain Wet Fern Forest (Map Unit 12) or Mountain Wet Herb Forest (Map Unit 15) which differ in their understorey composition and greater abundance of *E. fastigata.* Although most extensive on granitoid substrates of the escarpment and hinterland, it is also common on metasediments, particularly on central parts of the coastal range west of Merimbula. Restricted stands occur in coastal gullies in the Nadgee area. Clearing is a potential threat over the 8000 ha of Hinterland Wet Fern Forest that occur on private land. Logging may also threaten the diversity of woody species including trees where dense and rapid vegetative recovery of ferns after regeneration burns suppresses establishment of seedlings. Frequent burning is likely to exacerbate pressure on populations of woody species, especially in combination with logging or partial clearing activities. However, the threats posed by clearing, logging and frequent burning are not ubiquitous in Hinterland Wet Fern Forest, since about half of its extent is represented within conservation reserves. A similar assemblage has been described in East Gippsland (Community 13.2, Forbes et al. 1982) within the extensive damp forest complex (Ecological vegetation Class 29, Woodgate et al. 1994).



Map 13. Distribution of samples of Hinterland Wet Fern Forest (Map Unit 13) shown by large black squares. Samples of other map units shown as small grey points.

Plate 13. Hinterland Wet Fern Forest (Map Unit 13) dominated by *Eucalyptus cypellocarpa* with a dense groundcover of *Calochlaena dubia* in the upper New England Creek catchment, Murrabrine section of Wadbilliga National Park.

Species richness: 40 ± 1 (0.04 ha)
Extant area: 43 190 ha
Proportion cleared: 6%
Number of samples: 75

Table 13a. Diagnostic plant species of Map Unit 13.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Blechnum cartilagineum	0.614	2(1–4)	0.074	2(1–3)	positive
Calochlaena dubia	0.657	3.5(2–5)	0.085	2(1–3)	positive
Desmodium varians	0.629	2(1–2)	0.231	1(1–2)	positive
Doodia aspera	0.671	2(2–3)	0.074	2(1–2)	positive
Eucalyptus cypellocarpa	0.843	3(3–3)	0.287	3(2–3)	positive
Omalanthus populifolius	0.014	1(1–1)	0	0(0–0)	positive
Pomaderris aspera	0.557	2(1–3)	0.142	2(1–3)	positive
Psychotria loniceroides	0.014	1(1–1)	0	0(0–0)	positive
Schizomeria ovata	0.014	1(1–1)	0	0(0–0)	positive
Smilax australis	0.771	2(1–2)	0.175	1(1–2)	positive
Tylophora barbata	0.929	2(1–2)	0.234	1(1–2)	positive
Poa meionectes	0.729	2(1–3)	0.529	2(1–3)	frequent
Pteridium esculentum	0.786	2(2–3)	0.566	2(1–3)	frequent
Eustrephus latifolius	0.6	1(1–2)	0.153	1(1–1)	frequent
Glycine clandestina	0.671	1(1–2)	0.31	1(1–2)	frequent
Stellaria flaccida	0.657	1(1–2)	0.189	1(1–2)	frequent
Viola hederacea subsp. *hederacea*	0.786	1(1–2)	0.42	2(1–2)	frequent
Acacia melanoxylon	0.243	1(1–3)	0.098	1(1–3)	uninformative
Acmena smithii	0.171	1(1–3)	0.025	4(2–4)	uninformative
Angophora floribunda	0.071	2(2–3)	0.096	2(1–3)	uninformative
Corymbia gummifera	0.029	2(2–2)	0.02	3(2–4)	uninformative
Eucalyptus agglomerata	0.057	2(1–3)	0.111	3(2–3)	uninformative
Eucalyptus baxteri	0.014	3(3–3)	0.008	3(2–3)	uninformative
Eucalyptus elata	0.271	3(2–4)	0.105	3(2–3)	uninformative
Eucalyptus fastigata	0.271	3(2–4)	0.134	3(3–4)	uninformative
Eucalyptus fraxinoides	0.014	3(3–3)	0.029	4(3–4)	uninformative
Eucalyptus globoidea	0.171	2(1–3)	0.246	3(1–3)	uninformative
Eucalyptus maidenii	0.029	2.5(2–3)	0.065	3(2–3)	uninformative
Eucalyptus muelleriana	0.443	3(2–4)	0.127	3(3–4)	uninformative
Eucalyptus obliqua	0.157	4(2–4)	0.191	3(2–4)	uninformative
Eucalyptus radiata	0.014	1(1–1)	0.08	3(1–3)	uninformative
Eucalyptus sieberi	0.143	1.5(1–4)	0.29	3(2–4)	uninformative
Eucalyptus smithii	0.071	1(1–4)	0.044	2(1–3)	uninformative
Eucalyptus viminalis	0.014	1(1–1)	0.059	3(1–3)	uninformative
Eucryphia moorei	0.014	1(1–1)	0.002	5(3–6)	uninformative
Lomandra longifolia	0.429	1.5(1–2)	0.555	2(1–2)	negative

Table 13b. Vegetation structure of Map Unit 13. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=44).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	31.5(1.2)	34(2)
Small tree	79.5	8.9(0.8)	31(3)
Shrub	93.2	2.1(0.2)	21(3)
Ground cover	100	0.7(0.1)	57(4)

Table 13c. Habitat characteristics of Map Unit 13. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		933	877–974	75
Altitude (m)		389	180–550	67
Slope (degrees)		16	4–26	62
Terrain class				
North	13			8
Intermediate	27			17
South	32			20
Flat	27			17
Parent material				
Devonian granitoids	44			33
Devonian high quartz sedimentaries	20			15
Low quartz sedimentaries	19			14
Ordovician high quartz sedimentaries	16			12
Tertiary Alluvium	1			1

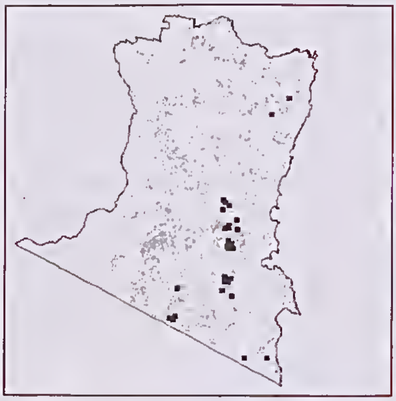
Map Unit 14: Hinterland Wet Shrub Forest

Hinterland Wet Shrub Forest is dominated by *Eucalyptus muelleriana* with *E. cypellocarpa* over 30 m tall. The understorey includes prominent strata of small trees and shrubs c. 3–9 m tall including *Acacia cognata, Elaeocarpus reticulatus, Goodenia ovata* and *Leucopogon lanceolatus.* The groundcover is dominated by forbs, *Gonocarpus teucrioides* and *Viola hederacea* and grasses, *Tetrarrhena juncea* and *Poa meionectes* with scattered fronds of *Pteridium esculentum.* Vines growing amongst the groundcover and shrubs include *Hibbertia dentata, Smilax australis, Tylophora barbata, Billardiera scandens* and *Clematis aristata.* Hinterland Wet Shrub Forest is widespread in gullies and steep moist sheltered slopes below 500 m elevation predominantly on metasediments of the coastal ranges. Outlying stands occur on granitoid substrates in the south-west hinterland near Mt Waalimma and Mt Poole. Where Hinterland Wet Shrub Forest co-occurs with Hinterland Wet Fern Forest (Map Unit 13), the latter generally occupies more mesic sites. Distinguishing features include the dominance of *E. muelleriana,* a more diverse tall shrub stratum and lack of fern swards in the understorey of Hinterland Wet Shrub Forest. Clearing is a potential threat over the 3800 ha of Hinterland Wet Shrub Forest that occurs on private land. Outside reserves, logging in combination with frequent burning may threaten the diversity of the understorey by interrupting life-history processes of woody species. In the most similar assemblage described in East Gippsland (Community 13.1, Forbes et al. 1982), *E. obliqua* is equally as frequent as *E. muelleriana* and neither are as frequent as *E. cypellocarpa.* As well, some understorey differences exist. For example elements common in the Eden assemblage such as *A. cognata* are infrequent in the East Gippsland community.

Species richness: 33 ± 2 (0.04 ha)
Extant area: 26 169 ha
Proportion cleared: 4%
Number of samples: 36

Table 14a. Diagnostic plant species of Map Unit 14.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia cognata	0.639	4(3–4)	0.033	2(1–3)	positive
Acacia maidenii	0.028	3(3–3)	0	0(0–0)	positive
Eucalyptus cypellocarpa	0.917	2(1–3)	0.299	3(2–3)	positive
Eucalyptus muelleriana	0.917	4(3–4)	0.123	3(2–3)	positive
Gonocarpus teucrioides	0.583	2(1–3)	0.309	2(1–2)	positive
Goodenia ovata	0.778	2(1–3)	0.158	2(1–2)	positive
Hibbertia dentata	0.556	2(1–2)	0.063	1(1–2)	positive
Pultenaea flexilis	0.028	2(2–2)	0	0(0–0)	positive
Smilax australis	0.556	2(1–2)	0.194	1(1–2)	positive
Tetrarrhena juncea	0.722	3(2–3)	0.169	2(1–3)	positive
Tylophora barbata	0.778	2(1–2)	0.254	2(1–2)	positive
Viola hederacea subsp. *hederacea*	0.778	2(1–2)	0.429	2(1–2)	positive
Poa meionectes	0.806	2(1–2)	0.532	2(1–3)	frequent
Pteridium esculentum	0.833	2(2–3)	0.57	2(1–3)	frequent
Billardiera scandens	0.722	1(1–2)	0.319	1(1–1)	frequent
Clematis aristata	0.722	1(1–2)	0.332	1(1–1)	frequent
Leucopogon lanceolatus var. *lanceolatus*	0.806	1(1–2)	0.396	1(1–2)	frequent
Lomandra longifolia	0.583	1(1–2)	0.548	2(1–2)	frequent
Acmena smithii	0.083	1(1–2)	0.031	3(1–4)	uninformative
Angophora floribunda	0.028	3(3–3)	0.097	2(1–3)	uninformative
Backhousia myrtifolia	0.028	1(1–1)	0.002	3(1–4)	uninformative
Elaeocarpus reticulatus	0.5	1(1–2)	0.065	1(1–2)	uninformative
Eucalyptus agglomerata	0.028	3(3–3)	0.111	3(2–3)	uninformative
Eucalyptus bosistoana	0.028	2(2–2)	0.054	2(1–3)	uninformative
Eucalyptus botryoides	0.056	2(1–3)	0.01	2(1–3)	uninformative
Eucalyptus elata	0.278	2(1–3)	0.109	3(2–3)	uninformative
Eucalyptus fastigata	0.028	2(2–2)	0.144	3(3–4)	uninformative
Eucalyptus globoidea	0.083	3(1–3)	0.247	3(1–3)	uninformative
Eucalyptus maidenii	0.028	3(3–3)	0.064	3(2–3)	uninformative
Eucalyptus obliqua	0.222	2(1–3)	0.189	3(2–4)	uninformative



Map 14. Distribution of samples of Hinterland Wet Shrub Forest (Map Unit 14) shown by large black squares. Samples of other map units shown as small grey points.

Plate 14. Hinterland Wet Shrub Forest (Map Unit 14) dominated by *Eucalyptus muelleriana*, *E. cypellocarpa* and *E. elata* with *Acacia falciformis*, *A. mearnsii*, *Elaeocarpus reticulatus* and *Cyathea australis* at Knights Creek crossing on Lizards Road, Murrah State Forest.

Eucalyptus radiata	0.028	1(1–1)	0.078	3(1–3)	uninformative
Eucalyptus sieberi	0.389	2(1–3)	0.28	3(2–4)	uninformative
Eucalyptus smithii	0.083	3(1–3)	0.045	2(1–3)	uninformative

Table 14b. Vegetation structure of Map Unit 14. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=17).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	31.9(1.5)	35(2)
Small tree	70.6	9.3(0.9)	30(6)
Shrub	100	3.6(0.6)	30(4)
Ground cover	100	0.8(0.1)	58(6)

Table 14c. Habitat characteristics of Map Unit 14. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		990	928–1041	36
Altitude (m)		390	318–475	35
Slope (degrees)		16	11–23	31
Terrain class				
North	16			5
Intermediate	26			8
South	45			14
Flat	13			4
Parent material				
Devonian granitoids	25			9
Devonian high quartz sedimentaries	47			17
Low quartz sedimentaries	8			3
Ordovician high quartz sedimentaries	19			7

Map Unit 15: Mountain Wet Herb Forest

Mountain Wet Herb Forest is dominated by *Eucalyptus obliqua* with *E. cypellocarpa* c. 32 m tall. The diverse understorey comprises an open stratum of shrubs up to 2.5 m tall including *Leucopogon lanceolatus* and *Coprosma quadrifida* and a well developed groundcover of herbs, *Dianella tasmanica, Lagenifera stipitata* and *Viola hederacea*, grasses and graminoids, *Hierochloe rariflora, Lomandra longifolia* and *Poa meionectes* with scattered ferns *Pteridium esculentum* and vines of *Clematis aristata*. Mountain Wet Herb Forest is widespread in large stands on moist sheltered granitoid slopes above 500 m elevation on the tableland range south from the upper Tantawangalo Creek catchment. The abundance of *E. obliqua* and prevalence of herbs in a mixed understorey with ferns and shrubs distinguish Mountain Wet Herb Forest from other wet forest assemblages. Approximately one-quarter of this extensive unit has been cleared for pine plantations in the upper Genoa River area and a further 3800 ha are potentially threatened by clearing on private land. Outside reserves, logging in combination with frequent burning may threaten the diversity of the understorey by interrupting life-history processes of woody species. Nevertheless, large stands of Mountain Wet Herb Forest are protected from these disturbance regimes in reserves. Although unlikely to extend further north of the Eden region, a similar assemblage which has a greater abundance of tall shrubs has been described in East Gippsland (Community 8.2, Forbes et al. 1982) within the extensive wet forest complex (Ecological vegetation Class 30, Woodgate et al. 1994).

Species richness: 33 ± 1 (0.04 ha)
Extant area: 30 895 ha
Proportion cleared: 26%
Number of samples: 132

Table 15a. Diagnostic plant species of Map Unit 15.

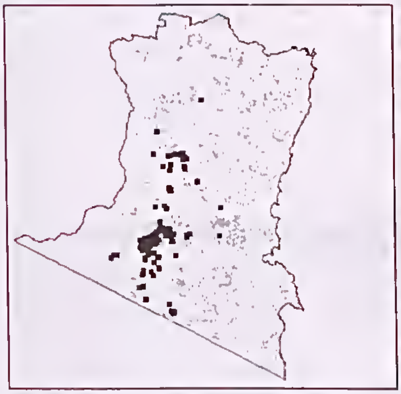
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Caladenia dilatata	0.008	1(1–1)	0	0(0–0)	positive
Daviesia virgata	0.008	1(1–1)	0	0(0–0)	positive
Dianella tasmanica	0.697	2(1–2)	0.19	1(1–2)	positive
Eucalyptus cypellocarpa	0.803	3(3–3)	0.266	3(1–3)	positive
Eucalyptus obliqua	0.886	3(3–4)	0.121	3(1–3)	positive
Hierochloe rariflora	0.599	3(2–3)	0.141	2(1–3)	positive
Juncus sandwithii	0.008	1(1–1)	0	0(0–0)	positive
Lagenifera stipitata	0.705	2(1–2)	0.287	1(1–2)	positive
Leucopogon lanceolatus var. *lanceolatus*	0.902	2(1–2)	0.357	1(1–2)	positive
Podolepis jaceoides	0.008	2(2–2)	0	0(0–0)	positive
Viola hederacea subsp. *hederacea*	0.955	2(1–2)	0.387	2(1–2)	positive
Lomandra longifolia	0.818	2(1–2)	0.522	2(1–2)	frequent
Poa meionectes	0.932	2(2–3)	0.5	2(1–3)	frequent
Pteridium esculentum	0.947	3(2–3)	0.54	2(1–3)	frequent
Clematis aristata	0.712	1(1–1)	0.305	1(1–1)	frequent
Coprosma quadrifida	0.621	1(1–2)	0.209	1(1–2)	frequent
Acacia melanoxylon	0.106	1(1–2)	0.105	1(1–3)	uninformative
Eucalyptus angophoroides	0.015	1.5(1–2)	0.047	2(1–3)	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.008	3(3–3)	0.019	2.5(1–3)	uninformative
Eucalyptus dives	0.008	1(1–1)	0.011	3(2–3)	uninformative
Eucalyptus elata	0.144	3(2–3)	0.11	3(2–3)	uninformative
Eucalyptus fastigata	0.205	2(1–3)	0.134	4(3–4)	uninformative
Eucalyptus fraxinoides	0.045	3(3–4)	0.027	4(3–4)	uninformative
Eucalyptus globoidea	0.318	2(1–3)	0.235	3(1–3)	uninformative
Eucalyptus maidenii	0.008	3(3–3)	0.069	3(2–3)	uninformative
Eucalyptus muelleriana	0.038	3(1–3)	0.152	3(2–4)	uninformative
Eucalyptus nitens	0.015	4(4–4)	0.012	3.5(3–4)	uninformative
Eucalyptus radiata	0.152	3(1–3)	0.069	3(1–3)	uninformative
Eucalyptus sieberi	0.318	2(1–3)	0.279	3(2–4)	uninformative
Eucalyptus smithii	0.023	3(3–4)	0.048	2(1–3)	uninformative
Eucalyptus sp. aff. *radiata*	0.121	3(2–4)	0.027	3(1–3)	uninformative
Eucalyptus viminalis	0.015	2(1–3)	0.061	3(1–3)	uninformative

Table 15b. Vegetation structure of Map Unit 15. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=97).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	32.3(0.6)	42(1)
Small tree	44.3	8.1(0.7)	20(2)
Shrub	99	2.4(0.1)	24(2)
Ground cover	100	0.7(0.0)	46(3)

Table 15c. Habitat characteristics of Map Unit 15. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1031	990–1061	132
Altitude (m)		736	608–850	132
Slope (degrees)		12	4–20	125
Terrain class				
North	8			10
Intermediate	36			44
South	30			37
Flat	26			32
Parent material				
Devonian granitoids	89			117
Devonian high quartz sedimentaries	3			4
Low quartz sedimentaries	2			3
Ordovician high quartz sedimentaries	5			7
Tertiary Basalt	1			1



Map 15. Distribution of samples of Mountain Wet Herb Forest (Map Unit 15) shown by large black squares. Samples of other map units shown as small grey points.

Plate 15. Mountain Wet Herb Forest (Map Unit 15) dominated by *Eucalyptus obliqua* and *E. cypellocarpa* with scattered *Calochlaena dubia, Doodia aspera* and forbs on the watershed between Wog Wog River and Basin Creek, Coolangubra section of South East Forests National Park.

Map Unit 16: Basalt Wet Herb Forest

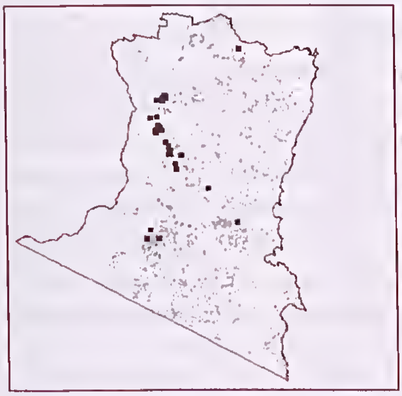
Basalt Wet Herb Forest is dominated by *Eucalyptus fastigata* with less frequent trees such as *E. cypellocarpa, E. radiata* and *E. viminalis* c. 30 m tall. There is a sparse stratum of shrubs comprised of infrequent species such as *Acacia melanoxylon,* sometimes growing as small trees to 7 m tall. The groundcover comprises a diverse, almost continuous cover of herbs including *Acaena nova-zelandiae, Asperula scoparia, Dianella tasmanica, Geranium potentilloides, Gonocarpus tetragynus, Hydrocotyle laxiflora, Stellaria pungens* and *Viola hederacea.* These and other small herbs are interspersed among clumps of *Lomandra longifolia, Poa meionectes* and *Pteridium esculentum* and trailing vines of *Glycine clandestina* and *Clematis aristata.* Basalt Wet Herb Forest occurs on gentle slopes on the edge of the tableland, usually at elevations above 700 m on either basalt or granitoid substrates. In higher rainfall areas close to the escarpment *E. fastigata* predominates, while *E. radiata* and *E. viminalis* are more common in drier areas further west. With decreasing rainfall Basalt Wet Herb Forest grades into Monaro Basalt Grass Woodland (Map Unit 23A). The diverse and dense herbaceous groundcover distinguishes this assemblage from other wet forests on the tableland range. One-sixth of Basalt Wet Herb Forest has been cleared and almost half of the remainder is on private land and potentially threatened by further clearing. Areas of this forest subject to grazing may be exposed to weed invasion and loss of diversity in the species-rich ground stratum. Stands in conservation reserves and State Forests are less exposed to these threats, although some weed invasion has followed logging of stands in western parts of Glenbog State Forest. A restricted assemblage on granitoid substrates on Erinundra Plateau in East Gippsland shares a similarly rich herbaceous groundcover and is dominated by *E. viminalis* and *E. radiata* (Community 8.4, Forbes et al. 1982). Similar assemblages are not known on basalt outside the Eden region, but forests on basalt have been extensively cleared for agriculture wherever they occur in eastern Australia. In East Gippsland, a very restricted forest community on basalt at 450 m elevation near Orbost is dominated by *E. pseudoglobulus* and *E. muelleriana* (Basaltic Damp Forest, Woodgate et al. 1994). Other examples of herb-rich forest on basalt also differ in composition (Ecological Vegetation Class 23, Woodgate et al. 1994).

Species richness: 35 ± 1 (0.04 ha)
Extant area: 12 263 ha
Proportion cleared: 18%
Number of samples: 32

Table 16a. Diagnostic plant species of Map Unit 16.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acaena novae-zelandiae	0.75	2(1–2)	0.118	1(1–2)	positive
Asperula scoparia	0.688	2(1–2)	0.055	1(1–2)	positive
Baumea gunnii	0.031	1(1–1)	0	0(0–0)	positive
Notodanthonia nudiflora	0.031	1(1–1)	0	0(0–0)	positive
Dianella tasmanica	0.906	2(2–3)	0.22	1(1–2)	positive
Eucalyptus fastigata	0.688	3(3–4)	0.129	3(3–4)	positive
Geranium potentilloides	0.563	2(1–2)	0.208	1(1–2)	positive
Glycine clandestina	0.594	2(1–2)	0.322	1(1–2)	positive
Gonocarpus tetragynus	0.656	2(1–2)	0.155	2(1–2)	positive
Hydrocotyle laxiflora	0.563	2(1–2)	0.198	2(1–2)	positive
Luzula densiflora	0.031	1(1–1)	0	0(0–0)	positive
Stellaria pungens	0.5	2(2–2)	0.058	1(1–2)	positive
Viola hederacea subsp. *hederacea*	0.938	2(2–2)	0.426	2(1–2)	positive
Lomandra longifolia	0.656	2(2–2)	0.547	2(1–2)	frequent
Poa meionectes	0.938	3(3–4)	0.53	2(1–3)	frequent
Pteridium esculentum	0.906	3(2–4)	0.569	2(1–3)	frequent
Clematis aristata	0.906	1(1–2)	0.329	1(1–1)	frequent
Lagenifera stipitata	0.719	1(1–2)	0.315	1(1–2)	frequent
Microlaena stipoides var. *stipoides*	0.656	1(1–2)	0.347	2(1–2)	frequent
Veronica calycina	0.781	1(1–1)	0.192	1(1–1)	frequent
Acacia melanoxylon	0.125	2.5(1–3)	0.105	1(1–3)	uninformative

Elaeocarpus holopetalus	0.031	1(1–1)	0.019	1(1–3)	uninformative
Eucalyptus badjensis	0.063	2(1–3)	0.006	3(3–4)	uninformative
Eucalyptus bosistoana	0.063	3.5(3–4)	0.053	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.438	3.5(3–4)	0.311	3(2–3)	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.156	2(1–3)	0.015	3(1–3)	uninformative
Eucalyptus elata	0.063	2.5(2–3)	0.114	3(2–3)	uninformative
Eucalyptus nitens	0.094	1(1–3)	0.01	4(3–4)	uninformative
Eucalyptus obliqua	0.25	3(2–4)	0.188	3(2–4)	uninformative
Eucalyptus pauciflora	0.063	2(1–3)	0.022	2(1–3)	uninformative
Eucalyptus radiata	0.313	2.5(2–3)	0.072	3(1–3)	uninformative
Eucalyptus rubida	0.063	1(1–1)	0.006	1(1–3)	uninformative
Eucalyptus smithii	0.031	1(1–1)	0.046	2(1–3)	uninformative
Eucalyptus viminalis	0.219	3(1–3)	0.053	3(1–3)	uninformative



Map 16. Distribution of samples of Basalt Wet Herb Forest (Map Unit 16) shown by large black squares. Samples of other map units shown as small grey points.

Plate 16. Basalt Wet Herb Forest (Map Unit 16) dominated by *Eucalyptus viminalis* and *E. fastigata* with a continuous groundcover of *Poa ensiformis, Dianella tasmanica* and *Polystichum proliferum* near Bull Mountain, Tantawangalo section of South East Forests National Park.

Table 16b. Vegetation structure of Map Unit 16. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=21).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	30.5(1.3)	38(4)
Small tree	47.6	7.4(0.8)	25(4)
Shrub	100	2.2(0.2)	12(2)
Ground cover	100	0.6(0.1)	73(5)

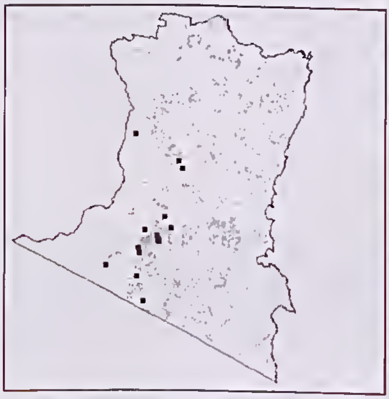
Table 16c. Habitat characteristics of Map Unit 16. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		929	891–954	32
Altitude (m)		915	848–1070	31
Slope (degrees)		9	4–14	31

	Frequency (%)	Mean	Interquartile Range	n
Terrain class				
North	16			5
Intermediate	32			10
South	23			7
Flat	29			9
Parent material				
Devonian Basalt	3			1
Devonian granitoids	56			18
Low quartz sedimentaries	3			1
Tertiary Basalt	38			12

Map Unit 17: Flats Wet Herb Forest

Flats Wet Herb Forest is a very species-rich assemblage dominated by *Eucalyptus viminalis* with less frequent trees including *E. elata* and *E. radiata* over 30 m tall. Scattered small trees or shrubs of *Acacia dealbata, A. melanoxylon, Cassinia aculeata, Pomaderris aspera, Senecio linearifolius* and *Pimelea axiflora* 3–17 m tall overtop a continuous and diverse groundcover comprising herbs *Acaena nova-zelandiae, Geranium potentilloides, Gonocarpus tetragynus, Hydrocotyle laxiflora, Stellaria* spp. and *Viola hederacea*, ferns *Blechnum nudum* and *Pteridium esculentum*, and grasses and graminoids *Carex appressa, Lomandra longifolia* and *Poa meionectes*. Flats Wet Herb Forest occupies gentle granitoid slopes (typically < 5°) in open valleys, usually around low-order drainage lines. Individual stands are comparatively small because of their topographically restricted habitat, and occur in dry, low-relief, low-rainfall areas to the east and west of the escarpment range. Approximately one-sixth of its extent has been cleared for pastoralism and half of the remainder occurs on private land or State Forest under grazing lease. Their gentle topography and comparatively rich deep soils predispose these stands to clearing and/or loss of groundcover diversity through grazing and weed invasion. Sedimentation associated with logging and feral pig rooting also pose threats to soils and the rich ground flora. While analogous habitats



Map 17. Distribution of samples of Flats Wet Herb Forest (Map Unit 17) shown by large black squares. Samples of other map units shown as small grey points.

Plate 17. Flats Wet Herb Forest (Map Unit 17) dominated by *Eucalyptus viminalis* with *Acacia dealbata* (flowering) and a continuous groundcover of *Pteridium esculentum, Poa labillardieri* and *Gahnia sieberi* near Waratah Creek, Coolangubra section of South East Forests National Park.

exist in East Gippsland, the majority of these apparently do not support similar species assemblages. Forbes et al. (1982) described a potentially similar stand beside the Genoa River at Wangarabell (part of Community 13.3). However, dry fertile colluvial flats in East Gippsland typically support herb-rich forest dominated by *E. melliodora*, *E. angophoroides*, *E. bosistoana* and *E. pseudoglobulus* in various combinations with qualitatively different shrub and groundcover species (Ecological Vegetation Class 23, Woodgate et al. 1994).

Species richness: 43 ± 3 (0.04 ha)
Extant area: 2949 ha
Proportion cleared: 17%
Number of samples: 19

Table 17a. Diagnostic plant species of Map Unit 17.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia dealbata	0.684	3(2–3)	0.131	2(1–3)	positive
Acaena novae-zelandiae	0.684	2(1–2)	0.125	1(1–2)	positive
Blechnum nudum	0.684	2(2–3)	0.072	2(1–4)	positive
Carex appressa	0.737	2(1–2)	0.076	1(1–2)	positive
Carex polyantha	0.053	2(2–2)	0	0(0–0)	positive
Cassinia aculeata	0.526	2(2–3)	0.158	1(1–2)	positive
Eucalyptus viminalis	0.79	3(3–3)	0.047	3(1–3)	positive
Geranium potentilloides	0.895	2(2–2)	0.207	1(1–2)	positive
Juncus pallidus	0.105	2(1–3)	0	0(0–0)	positive
Phebalium squameum	0.053	1(1–1)	0	0(0–0)	positive
Pimelea axiflora	0.526	2.5(2–3)	0.114	1(1–2)	positive
Podolepis hieracioides	0.053	2(2–2)	0	0(0–0)	positive
Pomaderris aspera	0.579	2(2–3)	0.156	2(1–3)	positive
Senecio linearifolius	0.684	2(1–4)	0.234	1(1–2)	positive
Stellaria flaccida	0.684	2(1–2)	0.205	1(1–2)	positive
Stellaria pungens	0.842	2(1–3)	0.057	1(1–2)	positive
Viola hederacea subsp. *hederacea*	0.737	2(2–2)	0.434	2(1–2)	positive
Lomandra longifolia	0.842	2(1–4)	0.545	2(1–2)	frequent
Poa meionectes	0.737	2(2–4)	0.536	2(1–3)	frequent
Pteridium esculentum	0.895	2(2–4)	0.573	2(1–3)	frequent
Lagenifera stipitata	0.632	1(1–2)	0.32	1(1–2)	frequent
Rubus parvifolius	0.632	1(1–2)	0.134	1(1–2)	frequent
Acacia melanoxylon	0.526	1.5(1–3)	0.1	1(1–3)	uninformative
Eucalyptus agglomerata	0.105	1.5(1–2)	0.109	3(2–3)	uninformative
Eucalyptus angophoroides	0.158	1(1–2)	0.043	2(1–3)	uninformative
Eucalyptus bosistoana	0.053	2(2–2)	0.053	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.053	2(2–2)	0.317	3(2–3)	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.105	1(1–1)	0.017	3(1–3)	uninformative
Eucalyptus elata	0.421	3(3–4)	0.109	3(1–3)	uninformative
Eucalyptus fastigata	0.158	1(1–1)	0.14	3(3–4)	uninformative
Eucalyptus maidenii	0.158	1(1–3)	0.062	3(3–3)	uninformative
Eucalyptus obliqua	0.263	1(1–2)	0.189	3(2–4)	uninformative
Eucalyptus ovata	0.105	2.5(2–3)	0.022	3(1–3)	uninformative
Eucalyptus pauciflora	0.053	1(1–1)	0.023	2(1–3)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.053	2(2–2)	0.012	2.5(2–3)	uninformative
Eucalyptus radiata	0.263	3(3–3)	0.074	3(1–3)	uninformative
Eucalyptus sp. aff. *radiata*	0.211	2(1–4)	0.033	3(2–3)	uninformative

Table 17b. Vegetation structure of Map Unit 17. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=13).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	92.3	31.8(1.3)	34(2)
Small tree	76.9	12.5(2.1)	15(4)
Shrub	92.3	3.0(0.5)	33(6)
Ground cover	100	0.9(0.1)	76(5)

Table 17c. Habitat characteristics of Map Unit 17. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		912	896–951	19
Altitude (m)		518	425–558	19
Slope (degrees)		4	0–3	19
Terrain class				
North	0			0
Intermediate	11			2
South	5			1
Flat	84			16
Parent material				
Devonian granitoids	95			18
Ordovician high quartz sedimentaries	5			1

Map Unit 18: Brogo Wet Vine Forest

Brogo Wet Vine Forest is dominated by *Eucalyptus tereticornis* with less frequent occurrences of *E. bosistoana* and *E. baueriana* c. 20 m tall, and occasional rainforest elements such as *Alectryon subcinerens* and *Ficus rubiginosa* up to 10 m tall. There is a diverse open stratum of shrubs including *Acacia implexa, Cassinia trinerva, Deeringia amaranthoides, Hymenanthera dentata* and *Breynia oblongifolia*. The species-rich groundcover is composed of large forbs such as *Sigesbeckia orientalis* and *Urtica incisa*, emerging from a diverse matrix of smaller forbs including *Dichondra repens, Geranium solanderi, Hydrocotyle laxiflora, Stellaria flaccida* and others. The groundcover also includes small ferns *Asplenium flabellifolium* and *Pellaea falcata,* and grasses and graminoids, *Oplismenus imbecillus, Microlaena stipoides, Carex appressa, Echinopogon ovatus* and *Poa labillardieri*. *Cenchrus caliculatus* is an infrequent but distinctive grass of this assemblage. A diverse array of vines and twiners is interspersed amongst the groundcover and shrub stratum. These include *Marsdenia rostrata, Clematis glycinoides, Geitonoplesium cymosum, Glycine clandestina* and *Stephania japonica*. Brogo Wet Vine Forest occurs on steep hilly terrain in the Brogo-Bega area at 100–300 m elevation, usually on granitoid substrates, but sometimes on outcrops of Ordovician mudstones near Bega. There are also stands in the Candelo–Myrtle Mountain area. This diverse assemblage is part of a complex of grassy ecosystems (Map Units 18–21) in the Bega valley and associated rainshadow areas. Occurring in the most elevated and wettest parts of the valley, it is distinguished from other assemblages by the dominance of *E. tereticornis* and the abundance of mesophyll shrubs and vines in the understorey. No similar assemblages have been described in adjacent regions (Austin 1978, Woodgate et al. 1994). Nearly half of this map unit has been cleared for agriculture and just under three-quarters of the remainder occurs on private land where is it potentially threatened by further clearing, grazing and weed invasion (Keith 1995). Frequent fire regimes as part of grazing management and hazard reduction also pose a potential threat, particularly to woody rainforest elements. Substantial areas of Brogo Wet Vine Forest remain in good condition, although remaining stands show symptoms of fine-scale clearing and grazing relative to other grassy assemblages in the Bega valley.

Species richness: 42 ± 2 (0.04 ha)
Extant area: 5046 ha
Proportion cleared: 42%
Number of samples: 16

Table 18a. Diagnostic plant species of Map Unit 18.

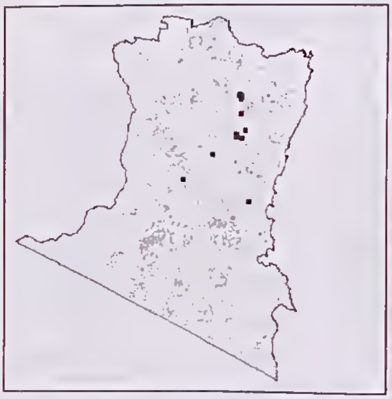
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia implexa	0.875	2(1–3)	0.042	1(1–2)	positive
Asplenium flabellifolium	0.563	2(1–2)	0.117	1(1–2)	positive
Cassinia trinerva	0.563	2(1–3)	0.078	1(1–3)	positive
Cissus antarctica	0.063	2(2–2)	0	0(0–0)	positive
Davallia pyxidata	0.063	1(1–1)	0	0(0–0)	positive
Deeringia amaranthoides	0.313	1(1–2)	0	0(0–0)	positive
Dichondra repens	1	2(2–2)	0.276	1(1–2)	positive
Eucalyptus tereticornis	0.625	3(3–3)	0.041	3(1–3)	positive
Geranium solanderi	0.938	2(1–2)	0.084	1(1–2)	positive
Hydrocotyle laxiflora	0.688	2(1–2)	0.201	2(1–2)	positive
Hymenanthera dentata	1	3(2–3)	0.06	1(1–2)	positive
Marsdenia rostrata	0.625	2(2–2)	0.08	2(1–2)	positive
Microlaena stipoides var. *stipoides*	0.938	3(2–4)	0.348	1(1–2)	positive
Oplismenus imbecillis	0.875	2(2–3)	0.1	2(1–2)	positive
Pellaea falcata var. *falcata*	1	2(2–3)	0.088	1(1–2)	positive
Sigesbeckia orientalis	0.813	2(1–2)	0.07	1(1–1)	positive
Stellaria flaccida	0.875	2(1–3)	0.204	1(1–2)	positive
Urtica incisa	0.875	2(2–3)	0.06	1(1–1)	positive
Breynia oblongifolia	0.75	1(1–2)	0.023	1(1–1)	frequent
Carex appressa	0.625	1(1–2)	0.078	1(1–2)	frequent
Clematis glycinoides	0.813	1(1–2)	0.108	1(1–2)	frequent
Desmodium varians	0.625	1.5(1–2)	0.246	1(1–2)	frequent
Echinopogon ovatus	0.688	1(1–2)	0.159	1(1–2)	frequent
Geitonoplesium cymosum	0.813	1(1–1)	0.102	1(1–2)	frequent
Glycine clandestina	0.875	1(1–2)	0.321	1(1–2)	frequent
Poa labillardieri var. *labillardieri*	0.625	1(1–3)	0.164	2(1–2)	frequent
Rubus parvifolius	0.75	1(1–2)	0.133	1(1–2)	frequent
Stephania japonica var. *discolor*	0.75	1.5(1–2)	0.017	1(1–1)	frequent
Acacia subporosa	0.063	2(2–2)	0.004	1.5(1–2)	uninformative
Acmena smithii	0.188	1(1–2)	0.03	3(1–4)	uninformative
Alectryon subcinereus	0.188	1(1–3)	0.005	1(1–2)	uninformative
Angophora floribunda	0.375	1(1–2)	0.092	2(1–3)	uninformative
Eucalyptus baueriana	0.063	1(1–1)	0.026	2(1–3)	uninformative
Eucalyptus bosistoana	0.375	2(1–3)	0.049	2(1–3)	uninformative
Eucalyptus globoidea	0.313	3(1–3)	0.242	3(1–3)	uninformative
Ficus rubiginosa	0.188	2(1–5)	0.008	4(1–6)	uninformative
Lomandra longifolia	0.188	1(1–2)	0.553	2(1–2)	negative
Poa meionectes	0	0(1–0)	0.545	2(1–3)	negative
Pteridium esculentum	0.313	2(1–2)	0.58	2(1–3)	negative

Table 18b. Vegetation structure of Map Unit 18. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=16).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	93.8	20.9(2.0)	21(5)
Small tree	81.3	10.7(1.1)	27(6)
Shrub	100	2.3(0.2)	24(6)
Ground cover	100	0.5(0.1)	56(6)

Table 18c. Habitat characteristics of Map Unit 18. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		934	886–989	16
Altitude (m)		216	193–245	16
Slope (degrees)		23	20–27	16
Terrain class				
North	44			7
Intermediate	31			5
South	25			4
Flat	0			0
Parent material				
Devonian granitoids	75			12
Devonian high quartz sedimentaries	6			1
Ordovician high quartz sedimentaries	19			3



Map 18. Distribution of samples of Brogo Wet Vine Forest (Map Unit 18) shown by large black squares. Samples of other map units shown as small grey points.

Plate 18. Brogo Wet Vine Forest (Map Unit 18) dominated by *Eucalyptus tereticornis*, *E. bosistoana* and *E. maidenii* with scattered *Hymenanthera dentata*, *Pittosporum undulatum* and *Ficus rubiginosa* on Warrigal Range Bush Heritage Property, north of Brogo.

Map Unit 19: Bega Wet Shrub Forest

Bega Wet Shrub Forest is a very species-rich assemblage dominated by *Eucalyptus elata* c. 25 m tall, with less frequent occurrences of *E. baueriana*, *E. globoidea* and *Angophora floribunda*. Intergrades of *E. botryoides* and *E. saligna* occur in the Cobargo district. *Acacia mearnsii* dominates a small tree stratum c. 10 m tall. The shrub stratum up to

3 m tall is dominated by *Cassinia trinerva* and *Hymenanthera dentata.* The diverse and largely continuous groundcover is composed of small forbs including *Desmodium varians, Dichondra repens, Hydrocotyle laxiflora, Stellaria flaccida, Galium propinquum, Gnaphalium gymnocephalum, Oxalis* spp., *Plantago debilis* and others. The groundcover also includes ferns *Adiantum aethiopicum, Pellaea falcata* and *Pteridium esculentum,* and grasses *Oplismenus imbecillus, Microlaena stipoides, Echinopogon ovatus* and *Poa meionectes,* and graminoids and lilioids *Lomandra longifolia* and *Arthropodium milleflorum. Rubus parvifolius, Clematis glycinoides* and *Glycine clandestina* twine amongst the groundcover. Bega Wet Shrub Forest occurs in dry lowland valleys between Cobargo and Towamba on sheltered slopes and in gullies up to 250 m elevation on Ordovician mudstone or granitoid substrates. This assemblage varies considerably in composition across its range, possibly in relation to soils. For example, an unusual variant dominated by *E. tereticornis* occurs on lowland Devonian basalts in the Wolumla-Nethercote area. Bega Wet Shrub Forest belongs to the complex of grassy ecosystems (Map Units 18–21) in the Bega valley and associated rainshadow areas. Occurring in the most sheltered parts of the valleys, it is distinguished from other assemblages by the dominance of *E. elata* and its prominent small tree and shrub strata. The existence of a similar assemblage in East Gippsland seems doubtful. A single sample of Bega Wet Shrub Forest at south Nungatta near the Victorian border suggests possible affinities to the depleted forests of the lower Cann and Genoa valleys. Woodgate et al (1994) include forest with *E. baueriana* and *E. bosistoana* on flats of the Cann and Genoa River valleys, which are now largely cleared, within Riparian Forest (Ecological Vegetation Class 18) along with other more widespread types of wet forest more closely resembling hinterland wet forests in Eden (Map Units 13 & 14). To the north, similar vegetation occurs in the Yowrie–Wandella area, e.g. at Dignams Creek (CSIRO 1996). Two-thirds of Bega Wet Shrub Forest has been cleared for agriculture and three-quarters of the remainder occurs on private land where is it potentially threatened by further clearing, grazing and weed invasion (Keith 1995). Frequent fire implemented for hazard reduction and grazing management also pose a potential threat, especially to woody components of the community.
Species richness: 48 ± 2 (0.04 ha)
Extant area: 17 959 ha
Proportion cleared: 63%
Number of samples: 38

Table 19a. Diagnostic plant species of Map Unit 19.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia mearnsii	0.895	3(1–3)	0.144	2(1–3)	positive
Adiantum aethiopicum	0.553	2(1–2)	0.065	1(1–2)	positive
Cassinia trinerva	0.605	2(1–3)	0.07	1(1–2)	positive
Clematis glycinoides	0.684	2(1–2)	0.1	1(1–1)	positive
Cyperus sphaeroideus	0.026	1(1–1)	0	0(0–0)	positive
Desmodium varians	0.842	2(1–2)	0.234	1(1–2)	positive
Dichondra repens	0.868	2(2–2)	0.269	1(1–2)	positive
Eucalyptus elata	0.605	3(1–4)	0.1	3(2–3)	positive
Geranium retrorsum	0.053	1(1–1)	0	0(0–0)	positive
Glycine clandestina	0.947	2(1–2)	0.311	1(1–2)	positive

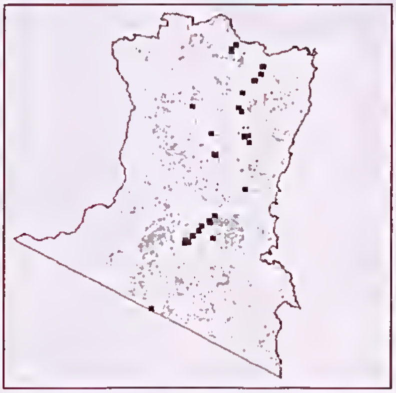
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Hydrocotyle laxiflora	0.868	2(2–2)	0.188	1(1–2)	positive
Mentha satureioides	0.053	1.5(1–2)	0	0(0–0)	positive
Microlaena stipoides var. *stipoides*	0.947	2(2–3)	0.338	1(1–2)	positive
Oplismenus imbecillis	0.737	2(1–3)	0.092	2(1–2)	positive
Oxalis chnoodes	0.026	1(1–1)	0	0(0–0)	positive
Oxalis rubens	0.026	1(1–1)	0	0(0–0)	positive
Paspalum orbiculare	0.026	1(1–1)	0	0(0–0)	positive
Pellaea falcata var. *falcata*	0.632	2(1–3)	0.084	1(1–2)	positive
Stellaria flaccida	0.711	2(1–2)	0.198	1(1–2)	positive
Poa meionectes	0.632	2(1–3)	0.536	2(1–3)	frequent
Pteridium esculentum	0.684	2(1–2)	0.574	2(1–3)	frequent
Arthropodium milleflorum	0.632	1(1–2)	0.048	1(1–1)	frequent
Echinopogon ovatus	0.868	1(1–2)	0.146	1(1–2)	frequent
Galium propinquum	0.658	1(1–1)	0.126	1(1–1)	frequent
Gnaphalium gymnocephalum	0.632	1(1–1)	0.172	1(1–1)	frequent
Hymenanthera dentata	0.658	1(1–3)	0.054	1(1–2)	frequent
Lomandra longifolia	0.763	1(1–2)	0.543	2(1–2)	frequent
Oxalis perennans	0.605	1(1–1)	0.212	1(1–1)	frequent
Plantago debilis	0.605	1(1–2)	0.1	1(1–1)	frequent
Rubus parvifolius	0.79	1(1–2)	0.123	1(1–2)	frequent
Angophora floribunda	0.368	1(1–2)	0.088	2(1–3)	uninformative
Eucalyptus angophoroides	0.158	2(1–3)	0.041	2(1–3)	uninformative
Eucalyptus baueriana	0.368	3(1–4)	0.017	2(1–3)	uninformative
Eucalyptus bosistoana	0.132	1(1–3)	0.051	2(1–3)	uninformative
Eucalyptus botryoides–*E. saligna*	0.132	3(2–4)	0.008	1(1–2)	uninformative
Eucalyptus cypellocarpa	0.053	3(3–3)	0.321	3(2–3)	uninformative
Eucalyptus globoidea	0.368	1(1–3)	0.239	3(1–3)	uninformative
Eucalyptus maidenii	0.105	3(3–3)	0.062	3(2–3)	uninformative
Eucalyptus melliodora	0.053	1.5(1–2)	0.01	2(1–3)	uninformative
Eucalyptus muelleriana	0.026	2(2–2)	0.145	3(2–4)	uninformative
Eucalyptus ovata	0.026	3(3–3)	0.023	3(1–3)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.026	1(1–1)	0.014	2(2–3)	uninformative
Eucalyptus radiata	0.053	2(1–3)	0.077	3(1–3)	uninformative
Eucalyptus sieberi	0.026	1(1–1)	0.289	3(2–4)	uninformative
Eucalyptus tereticornis	0.158	2(1–3)	0.044	3(1–3)	uninformative
Eucalyptus viminalis	0.105	1.5(1–3)	0.056	3(1–3)	uninformative

Table 19b. Vegetation structure of Map Unit 19. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=28).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	24.9(1.0)	25(2)
Small tree	96.4	9.3(0.7)	19(3)
Shrub	96.4	2.6(0.2)	25(5)
Ground cover	100	0.4(0.1)	68(5)

Table 19c. Habitat characteristics of Map Unit 19. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		884	832–955	38
Altitude (m)		193	129–268	38
Slope (degrees)		20	10–24	38
Terrain class				
North	16			6
Intermediate	26			10
South	50			19
Flat	8			3
Parent material				
Devonian granitoids	66			25
Devonian high quartz sedimentaries	3			1
Ordovician high quartz sedimentaries	32			12



Map 19. Distribution of samples of Bega Wet Shrub Forest (Map Unit 19) shown by large black squares. Samples of other map units shown as small grey points.

Plate 19. Bega Wet Shrub Forest (Map Unit 19) dominated by *Eucalyptus baueriana, E. viminalis* and *E. radiata* with a prominent shrub stratum of *Cassinia longifolia* and *Kunzea ericoides*, and groundcover dominated by *Lepidosperma gunnii* near Myrtle Creek, Yowaka section of South East Forests National Park.

Map Unit 20: Bega Dry Grass Forest

Bega Dry Grass Forest is dominated by *Eucalyptus tereticornis* with *E. globoidea* and *Angophora floribunda.* Although extant stands average 20 m in height, these are largely regrowth of originally taller forests. *Acacia mearnsii* dominates an open small tree stratum 9 m tall, while an open shrub stratum includes *Bursaria spinosa* and *Ozothamnus diosmifolius*. The characteristic diverse grassy groundcover is dominated by *Themeda australis, Echinopogon caespitosus, E. ovatus, Microlaena stipoides* and *Eragrostis leptostachya* with forbs such as *Dichondra repens, Desmodium varians, Hydrocotyle laxiflora, Hypericum gramineum, Glycine clandestina* and the fern *Cheilanthes sieberi.* Bega Dry Grass Forest occurs on undulating terrain in the Cobargo–Bega–Candelo area and the Towamba valley below 250 m elevation on granitoid substrates and Ordovician mudstones. Small stands also occur on fine-grained igneous intrusives on the coast near Tanja. This assemblage is part of a complex of grassy ecosystems (Map Units 18–21) in the Bega valley and associated rainshadow areas. It is distinguished from other assemblages by the dominance of *E. tereticornis* usually with *A. floribunda* and a prominent grassy understorey. Local frost hollows near Wolumla may include *E. pauciflora*. No similar assemblages have been described in adjacent regions (Austin 1978, Woodgate et al. 1994), although stands of *E. tereticornis* occur near Moruya to the north. Nearly 90% of this vegetation has been cleared for agriculture and almost all of the remainder is highly fragmented on private land where is it potentially threatened by further clearing, grazing and weed invasion (Keith 1995).

Species richness: 39 ± 1 (0.04 ha)
Extant area: 4429 ha
Proportion cleared: 86%
Number of samples: 48

Table 20a. Diagnostic plant species of Map Unit 20.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Bursaria spinosa	0.604	2(1–3)	0.107	1(1–2)	positive
Dichondra repens	0.979	2(1–2)	0.261	1(1–2)	positive
Echinopogon caespitosus	0.5	2(1–2)	0.024	1(1–1)	positive
Echinopogon ovatus	0.542	2(1–2)	0.152	1(1–2)	positive
Eucalyptus tereticornis	0.521	3(1–3)	0.031	3(1–3)	positive
Glycine sp. aff. *tomentella*	0.063	1(1–1)	0	0(0–0)	positive
Laxmannia gracilis	0.063	1(1–1)	0	0(0–0)	positive
Microlaena stipoides var. *stipoides*	0.979	3(2–4)	0.333	1(1–2)	positive
Polygala japonica	0.021	1(1–1)	0	0(0–0)	positive
Austrostipa densiflora	0.021	2(2–2)	0	0(0–0)	positive
Themeda australis	0.896	3(2–4)	0.088	2(1–3)	positive
Vittadinia dissecta var. *dissecta*	0.021	1(1–1)	0	0(0–0)	positive
Acacia mearnsii	0.667	1(1–3)	0.146	2(1–3)	frequent
Cheilanthes sieberi subsp. *sieberi*	0.75	1(1–2)	0.039	1(1–1)	frequent
Desmodium varians	0.625	1(1–2)	0.237	2(1–2)	frequent
Eragrostis leptostachya	0.667	1(1–2)	0.025	2(1–2)	frequent
Glycine clandestina	0.833	1(1–2)	0.31	1(1–2)	frequent
Hydrocotyle laxiflora	0.792	1.5(1–2)	0.186	2(1–2)	frequent
Hypericum gramineum	0.604	1(1–1)	0.23	1(1–2)	frequent
Ozothamnus diosmifolius	0.708	1(1–2)	0.058	1(1–1)	frequent
Lomandra longifolia	0.75	1(1–1)	0.542	2(1–2)	frequent
Angophora floribunda	0.458	3(1–4)	0.083	2(1–3)	uninformative
Eucalyptus agglomerata	0.042	3(3–3)	0.111	3(2–3)	uninformative
Eucalyptus angophoroides	0.021	1(1–1)	0.045	2(1–3)	uninformative
Eucalyptus baueriana	0.167	1(1–3)	0.022	2(2–3)	uninformative
Eucalyptus bosistoana	0.104	3(2–3)	0.051	2(1–3)	uninformative
Eucalyptus botryoides	0.042	1.5(1–2)	0.011	2(1–3)	uninformative
Eucalyptus dives	0.021	3(3–3)	0.011	3(2–3)	uninformative
Eucalyptus elata	0.208	3(3–4)	0.11	3(1–3)	uninformative
Eucalyptus globoidea	0.438	3(2–4)	0.236	3(1–3)	uninformative
Eucalyptus maidenii	0.042	2(1–3)	0.064	3(2–3)	uninformative
Eucalyptus melliodora	0.042	2(1–3)	0.011	2(1–3)	uninformative

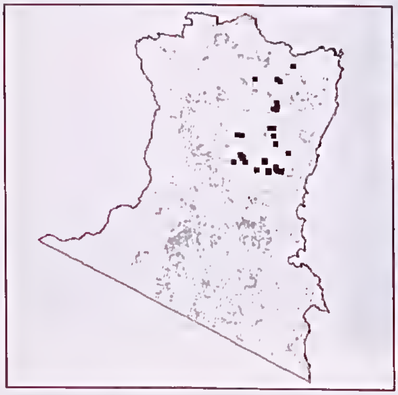
Eucalyptus pauciflora	0.021	1(1–1)	0.023	2(1–3)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.021	1(1–1)	0.014	2(2–3)	uninformative
Eucalyptus radiata	0.042	2(1–3)	0.078	3(1–3)	uninformative
Eucalyptus sieberi	0.063	3(1–4)	0.29	3(2–4)	uninformative
Eucalyptus viminalis	0.083	3(2–4)	0.056	3(1–3)	uninformative
Poa meionectes	0.125	1(1–1)	0.553	2(1–3)	negative
Pteridium esculentum	0.25	1(1–2)	0.588	2(1–3)	negative

Table 20b. Vegetation structure of Map Unit 20. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=47).

Stratum	**Frequency (%)**	**Height (m)**	**Cover (%)**
Tree	100	21.3(0.7)	23(2)
Small tree	80.9	8.9(0.5)	15(2)
Shrub	97.9	2.4(0.1)	19(2)
Ground cover	100	0.4(0.0)	62(4)

Table 20c. Habitat characteristics of Map Unit 20. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	**Mean**	**Interquartile Range**	**n**
Annual rain (mm)		822	768–835	48
Altitude (m)		132	99–176	48
Slope (degrees)		14	8–19	48
Terrain class				
North	32			15
Intermediate	47			22
South	17			8
Flat	4			2
Parent material				
Devonian granitoids	33			16
Devonian high quartz sedimentaries	13			6
Ordovician high quartz sedimentaries	54			26



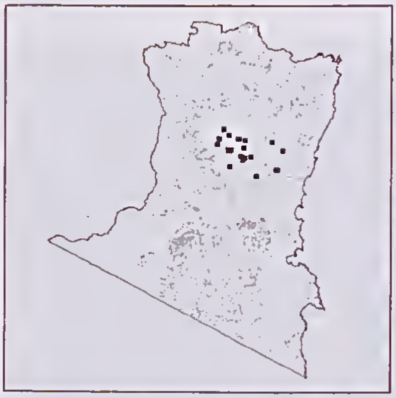
Map 20. Distribution of samples of Bega Dry Grass Forest (Map Unit 20) shown by large black squares. Samples of other map units shown as small grey points.

Plate 20. Bega Dry Grass Forest (Map Unit 20) dominated by *Eucalyptus tereticornis* and occasional *E. baueriana* with *Indigofera australis, Themeda australis* and *Microlaena stipoides* alongside a fenced roadside north of Wolumla, showing the effects of light grazing.

Map Unit 21: Candelo Dry Grass Forest

Candelo Dry Grass Forest is dominated by *Eucalyptus tereticornis, E. globoidea* and *Angophora floribunda*, usually with *E. melliodora* c. 22 m tall. *Acacia mearnsii* is the most frequent species in sparse strata of small trees and shrubs 2–8 m tall. The distinctive and diverse grassy groundcover is dominated by *Themeda australis, Notodanthonia racemosa, Dichanthium sericeum, Eragrostis leptostachya, Microlaena stipoides* and *Dichelachne micrantha*, with forbs including *Dichondra repens, Desmodium varians, Hydrocotyle laxiflora, Geranium solanderi* and *Gnaphalium gymnocephalum. Glycine tabacina* and *G. clandestina* trail amongst the groundcover. Candelo Dry Grass Forest occurs on undulating terrain in the driest western parts of the Bega and Towamba valleys below 300 m elevation on granitoid substrates or rarely Ordovician mudstones. Frost hollows near Candelo support stands of *E. pauciflora*, but these persist only as small highly modified remnants. This assemblage is part of a complex of grassy ecosystems (Map Units 18–21) in the Bega valley and associated rainshadow areas. It is distinguished from other assemblages by the inclusion of *E. melliodora* in the tree stratum and groundcover elements such as *Dichanthium sericeum* and *Glycine tabacina*. It generally grades from west to east into Bega Dry Grass Forest (Map Unit 20), and the precise boundary between these units is somewhat arbitrary, although an outlying stand of Candelo Dry Grass Forest has been recorded between Bega and Wolumla. No similar assemblages have been described in adjacent regions (Austin 1978, Woodgate et al. 1994). Over 90% of this vegetation has been cleared for agriculture and almost all of the remaining 1500 ha is highly fragmented on private land where is it threatened by further clearing, grazing and weed invasion (Keith 1995).

Species richness: 35 ± 3 (0.04 ha)
Extant area: 1571 ha
Proportion cleared: 91%
Number of samples: 28



Map 21. Distribution of samples of Candelo Dry Grass Forest (Map Unit 21) shown by large black squares. Samples of other map units shown as small grey points.

Plate 21. Candelo Dry Grass Forest (Map Unit 21) remnant dominated by *Eucalyptus tereticornis* and *E. melliodora* with a continuous grassy understorey dominated by *Themeda australis* at Bemboka cemetery.

Table 21a. Diagnostic plant species of Map Unit 21.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Angophora floribunda	0.679	3(1–4)	0.084	2(1–3)	positive
Brachycome ciliata var. *ciliata*	0.071	1(1–1)	0	0(0–0)	positive
Chloris ventricosa	0.036	2(2–2)	0	0(0–0)	positive
Notodanthonia racemosa var. *racemosa*	0.679	2(1–2)	0.039	1(1–2)	positive
Dichanthium sericeum	0.429	1(1–2)	0	0(0–0)	positive
Dichondra repens	0.893	2(2–3)	0.272	1(1–2)	positive
Eragrostis leptostachya	0.75	2(2–3)	0.033	1(1–2)	positive
Eucalyptus globoidea	0.643	3(1–3)	0.235	3(1–3)	positive
Eucalyptus tereticornis	0.786	3(1–3)	0.033	3(1–3)	positive
Glycine tabacina	0.536	2(1–2)	0.024	1(1–2)	positive
Hydrocotyle laxiflora	0.75	2(1–2)	0.195	2(1–2)	positive
Microlaena stipoides var. *stipoides*	0.857	2(2–3)	0.344	1(1–2)	positive
Plantago hispida	0.036	4(4–4)	0	0(0–0)	positive
Themeda australis	0.821	4(3–4)	0.1	2(1–3)	positive
Zornia dyctiocarpa	0.036	1(1–1)	0	0(0–0)	positive
Acacia mearnsii	0.607	1(1–3)	0.154	2(1–3)	frequent
Desmodium varians	0.679	1(1–2)	0.242	1(1–2)	frequent
Dichelachne micrantha	0.714	1(1–2)	0.073	1(1–2)	frequent
Geranium solanderi	0.714	1(1–2)	0.081	1(1–2)	frequent
Glycine clandestina	0.786	1(1–2)	0.319	1(1–2)	frequent
Gnaphalium gymnocephalum	0.714	1(1–1)	0.173	1(1–1)	frequent
Eucalyptus baueriana	0.036	1(1–1)	0.026	2(1–3)	uninformative
Eucalyptus bosistoana	0.071	1.5(1–2)	0.053	2(1–3)	uninformative
Eucalyptus elata	0.071	1(1–1)	0.114	3(2–3)	uninformative
Eucalyptus maidenii	0.107	3(3–3)	0.062	3(2–3)	uninformative
Eucalyptus melliodora	0.429	1.5(1–3)	0.003	2(1–3)	uninformative
Eucalyptus viminalis	0.036	1(1–1)	0.057	3(1–3)	uninformative
Lomandra longifolia	0.321	1(1–1)	0.553	2(1–2)	negative
Poa meionectes	0.429	1.5(1–3)	0.541	2(1–3)	negative
Pteridium esculentum	0.179	1(1–2)	0.585	2(1–3)	negative

Table 21b. Vegetation structure of Map Unit 21. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=28).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	22.4(0.8)	24(2)
Small tree	50	8.4(0.8)	20(4)
Shrub	89.3	1.9(0.2)	12(3)
Ground cover	100	0.3(0.0)	77(4)

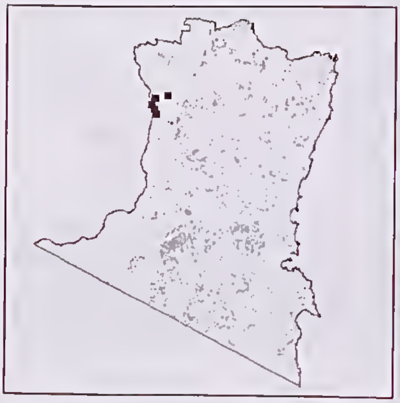
Table 21c. Habitat characteristics of Map Unit 21. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		792	774–816	28
Altitude (m)		149	105–183	28
Slope (degrees)		14	8–21	28

	Frequency (%)	Mean	Interquartile Range	n
Terrain class				
North	14			4
Intermediate	61			17
South	18			5
Flat	7			2
Parent material				
Devonian granitoids	86			24
Ordovician high quartz sedimentaries	14			4

Map Unit 22A: Monaro Dry Grass Forest

Monaro Dry Grass Forest is dominated by *Eucalyptus pauciflora, E. rubida* and *E. viminalis*. Scattered shrubs of *Acacia dealbata* emerge from a stratum of smaller shrubs, *Bossiaea foliosa, Gompholobium minus* and *Mirbelia oxylobioides* and grassy groundcover dominated by *Themeda australis* and *Poa labillardieri*, with forbs including *Asperula scoparia* and *Gonocarpus tetragynus*. Monaro Dry Grass Forest occurs on flat to undulating terrain in the Monaro rainshadow (< 840 mm annual precipitation) from Bombala north to Numeralla above 900 m elevation on granitoid substrates or rarely fine-grained metasediments. This assemblage is part of a complex of grassy assemblages (Map Units 22–24) on the Monaro Tableland rainshadow area. Similar assemblages are found both to the north and south-west. In East Gippsland near Suggan Buggan, one of two floristic entities within Ecological Vegetation Class 37 (Woodgate et al. 1994, Community 5.3 of Forbes et al. 1982) shares similar canopy and groundcover elements. Similar vegetation also occurs east of Cooma to the north (Austin 1978, CSIRO 1996). Approximately one-third of Monaro Dry Grass Forest has been cleared for agriculture. The remainder occurs almost entirely on private and leasehold where weed invasion and overgrazing in dry periods are likely to cause a decline in groundcover diversity. Further clearing may also pose a significant threat to the 7000 ha that occurs on private land.



Map 22A. Distribution of samples of Monaro Dry Grass Forest (Map Unit 22A) shown by large black squares. Samples of other map units shown as small grey points.

Plate 22A. Monaro Dry Grass Forest (Map Unit 22A) dominated by *Eucalyptus viminalis* with *E. pauciflora* and *E. dives* with a grassy understorey dominated by *Poa meionectes* on New Line Road, Glen Allen State Forest.

Species richness: 16 ± 1 (0.04 ha)
Extant area: 8222 ha
Proportion cleared: 31%
Number of samples: 5

Table 22Aa. Diagnostic plant species of Map Unit 22A.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia dealbata	0.6	3(3–3)	0.136	2(1–3)	positive
Asperula scoparia	0.8	2.5(2–3)	0.066	1(1–2)	positive
Bossiaea foliosa	0.6	2(1–3)	0.016	1(1–2)	positive
Dichelachne inaequiglumis	0.2	3(3–3)	0	0(0–0)	positive
Eucalyptus parvula	0.2	1(1–1)	0	0(0–0)	positive
Eucalyptus pauciflora	1	3(1–3)	0.02	2(1–3)	positive
Eucalyptus rubida	0.6	3(1–3)	0.005	1(1–1)	positive
Eucalyptus viminalis	0.6	3(3–3)	0.055	3(1–3)	positive
Gompholobium minus	0.4	1.5(1–2)	0	0(0–0)	positive
Gonocarpus tetragynus	0.6	2(2–2)	0.164	2(1–2)	positive
Mirbelia oxylobioides	0.4	2.5(2–3)	0	0(0–0)	positive
Themeda australis	0.8	2(1–3)	0.112	2(1–3)	positive
Poa labillardieri var. *labillardieri*	0.8	1.5(1–2)	0.167	1(1–3)	frequent
Lomandra longifolia	0.4	1.5(1–2)	0.549	2(1–2)	negative
Poa meionectes	0.2	3(3–3)	0.54	2(1–3)	negative
Pteridium esculentum	0	0(0–0)	0.579	2(1–3)	negative

Table 22Ab. Habitat characteristics of Map Unit 22A. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		635	711–828	5
Altitude (m)		1084	1080–1120	5
Slope (degrees)		-	-	0
Terrain class				
North	0			0
Intermediate	0			0
South	20			1
Flat	80			4
Parent material				
Devonian granitoids	80			4
Low quartz sedimentaries	20			1

Map Unit 22B: Numeralla Dry Grass Woodland

Numeralla Dry Grass Woodland is dominated by *Eucalyptus dives*, sometimes with *E. dalrympleana* and *E. pauciflora*. *Eucalyptus mannifera* and *E. rubida* may also be locally common. The tree stratum is low (c. 15 m) and open. The shrub stratum is dominated by *Acacia falciformis*, *A. dealbata*, *Exocarpos strictus* and *Gompholobium huegelii*. The groundcover includes scattered tussocks of *Poa meionectes* and *Lomandra longifolia* with large clumps of *Chrysocephalum semipapposum*. and grassy groundcover dominated by *Themeda australis* and *Poa labillardieri*, with forbs including *Asperula scoparia* and *Gonocarpus tetragynus*. Numeralla Dry Grass Woodland occurs on dry stony ridges in the upper Numeralla and McLaughlan River catchments above 900 m elevation on metasediments. This assemblage is part of a complex of grassy assemblages (Map Units 22–24) on the Monaro Tableland rainshadow area. It differs from other Monaro assemblages in the dominance of *E. dives* and its abundance of shrubs relative to grasses. This assemblage is likely to extend further north, east of Cooma (Costin 1954, Austin 1978, CSIRO 1996). The most similar assemblage in East Gippsland is associated with the Snowy, Deddick and Delegate River gorges and includes additional tree species and a more diverse array of shrubs (Community 5.1 of Forbes et al. 1982, Ecological Vegetation Class 36 of Woodgate et al. 1994). Approximately one-third of Numeralla Dry Grass Woodland has been cleared for agriculture and about one-quarter occurs in a recently dedicated reserve. The remainder occurs mainly on private and leasehold land. Further clearing poses the most significant threat to the 1300 ha that occurs on private land, although these are unlikely to be very productive grazing lands. Rough grazing may cause a decline in groundcover diversity and weed invasion, depending on stocking rates.

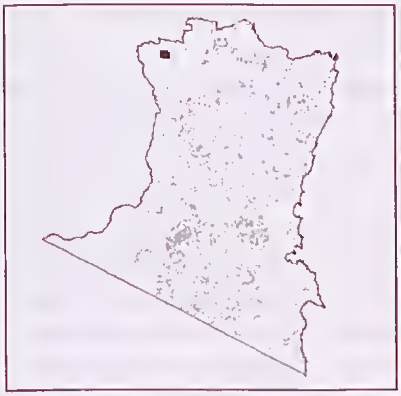
Species richness: 13 ± 3 (0.04 ha)
Extant area: 3611 ha
Proportion cleared: 33%
Number of samples: 3

Table 22Ba. Diagnostic plant species of Map Unit 22B.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia falciformis	1	2(2–2)	0.188	2(1–3)	positive
Chrysocephalum semipapposum	1	3(2–3)	0.008	1(1–2)	positive
Eucalyptus dives	1	3(3–3)	0.01	3(2–3)	positive
Exocarpos strictus	0.667	2(2–2)	0.17	1(1–2)	positive
Gompholobium huegelii	0.667	2(2–2)	0.015	1(1–1)	positive
Leucopogon hookeri	0.333	2(2–2)	0	0(0–0)	positive
Persoonia rigida	0.333	2(2–2)	0	0(0–0)	positive
Poa meionectes	1	2(2–3)	0.538	2(1–3)	frequent
Acacia dealbata	0.667	1.5(1–2)	0.137	2(1–3)	frequent
Acaena novae-zelandiae	1	1(1–2)	0.13	1(1–2)	frequent
Lomandra longifolia	1	1(1–2)	0.548	2(1–2)	frequent
Eucalyptus dalrympleana subsp. *dalrympleana*	0.3333	1(1–1)	0.01868	3(1–3)	uninformative
Eucalyptus pauciflora	0.3333	1(1–1)	0.02253	2(1–3)	uninformative
Pteridium esculentum	0	0(2–0)	0.578	2(1–3)	negative

Table 22Bb. Vegetation structure of Map Unit 22B. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=3).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	14.3(0.7)	20(0)
Small tree	33.3	6.0(-)	5(-)
Shrub	100	2.2(0.9)	25(8)
Ground cover	100	0.3(0.1)	20(6)



Map 22B. Distribution of samples of Numeralla Dry Grass Woodland (Map Unit 22B) shown by large black squares. Samples of other map units shown as small grey points.

Plate 22B. Numeralla Dry Grass Woodland (Map Unit 22B) dominated by *Eucalyptus rubida, E. dives* and *E. pauciflora* with *Chrysocephalum semipapposum, Hibbertia obtusifolia, Daviesia corymbosa* and *Grevillea lanigera* on McLaughlin River near Snowy Highway crossing.

Table 22Bc. Habitat characteristics of Map Unit 22B. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		658	647–677	3
Altitude (m)		1003	970–1050	3
Slope (degrees)		17	11–22	3
Terrain class				
North	0			0
Intermediate	33			1
South	67			2
Flat	0			0
Parent material				
Low quartz sedimentaries	100			3

Map Unit 23A: Monaro Grassland

Monaro Grassland includes several floristic assemblages characteristic of different habitats and disturbance histories. Floristic data recorded in 10 x 10 m quadrats were compiled from Benson (1994) who recognised eight grassland assemblages on the Monaro Tableland, of which three were sampled in the Eden study area. The grasses *Poa sieberiana, Themeda australis* and *P. labillardieri* dominate Benson's communities 4, 5 and 8, respectively. Common interstitial herbs include *Acaena ovina, Geranium antrorsum, Asperula conferta, Chrysocephalum apiculatum, Leptorhychos squamatus, Plantago varia* and *Cullen tenax.* Grassland composition varies within the region according to substrate, soil moisture status and grazing history. Benson (1994) attributed differences in between communities 3 and 4 to differences in grazing pressure, while community 8 was found in low-lying poorly drained sites. Monaro Grassland occurs on heavy textured soils, usually derived from basalt, alluvium or granitoids above 800 m elevation in a rainshadow characterised by low rainfall (< 800 mm mean annual precipitation), periodic drought, drying summer winds, frosts and cold winter temperatures (Benson 1994). The largest and least disturbed stands occur between Bombala and Nimmitabel. Similar grasslands extend west and north-west on parts of the Monaro Tableland (Costin 1954, Benson 1994) and south into Victoria on the Nunniong High Plains and Emu Flat (Community 7.3, Walsh et al. 1983). However, there are notable differences in composition compared with alpine and subalpine grasslands in the Kosciusko area and Victorian alps and lowland grasslands in Victoria and Tasmania (Benson 1994, McDougall & Kirkpatrick 1993). All Australian temperate grasslands, including those of the Eden region persist in a highly modified, depleted state. Approximately one-twentieth of the region's grassland remains in a semi-natural state, although even this figure may be an overestimate. In the East Gippsland highlands, only 200 ha of degraded grassland remain (Woodgate et al. 1994). Most of the Monaro remnants are also heavily degraded by pasture improvement and overgrazing, although several small but significant patches retain a large complement of native species. These latter patches are associated with cemeteries, church yards, rubbish tips, travelling stock reserves, and other small parcels of land that have been excluded from the most intensive pastoral land management practices. There are currently no formal conservation reserves that contain examples of grassland assemblages in the region and opportunities for conservation on and off reserve are extremely limited. The severity of continuing degradation supports the need for urgent conservation. Clearing and nutrification associated with cropping and pasture improvement encourages the replacement of native species by fast-growing swards of exotic grasses and herbs. Weed invasion associated with nutrification is most pronounced along drainage lines supporting assemblages dominated by *Poa labillardieri* (Benson 1994). Nutrification may also be associated with compositional shifts within the native component of the flora, with *P. labillardieri* known to produce a greater growth response to fertilisers than *Themeda australis* (Groves et al. 1973). High levels of grazing pressure are also associated with compositional changes. Species with erect herbaceous growth forms (e.g. *Microseris lanceolata, Podolepis hieracioides, Bulbine bulbosa, Discaria pubescens*) are likely to be more prone to elimination by intense grazing than those with rosette growth forms, which include several ubiquitous weed species (McIntyre et al. 1995). *Themeda australis* appears to be less resilient to heavy grazing than other grasses (Vickery 1961, Benson 1994). Contemporary disturbance regimes may also be associated with loss of diversity from grasslands, since the persistence of some herbaceous species is known to be dependent on gap dynamics (e.g. Morgan 1997). Disturbance regimes comprising certain mixtures of fire and grazing (e.g. exclusion of fire and herbivores, high stocking rates and fire exclusion) have been implicated in the loss of grassland diversity (Lunt 1991).

Species richness: 11.0 ± 2.5 (0.01ha)
Extant area: 331 ha
Proportion cleared: 94%
Number of samples: 5

Table 23Aa. Diagnostic plant species of Map Unit 23A.

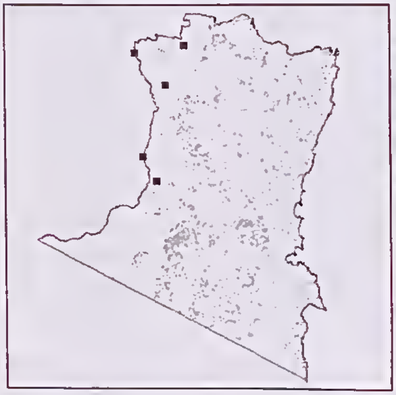
Species	Target frequency	Target C/A	Fidelity class
Poa sieberiana	0.6	3(2–4)	positive
Acaena ovina	0.6	1(1–1)	positive
Poa labillardieri	0.4	5(5–5)	positive
Themeda australis	0.4	4(2–6)	positive
Geranium antrorsum	0.4	2.5(1–4)	positive
Asperula conferta	0.4	2(2–2)	positive
Chrysocephalum apiculatum	0.4	2(2–2)	positive
Leptorhynchos squamatus	0.4	1.5(1–2)	positive
Plantago varia	0.4	1.5(1–2)	positive
Carex inversa	0.4	1(1–1)	positive
Notodanthonia caespitosa	0.4	1(1–1)	positive
Elymus scaber	0.4	1(1–1)	positive
Cullen tenax	0.4	1(1–1)	positive
Pimelea glauca	0.2	3(3–3)	positive
Poa meionectes	0.2	3(3–3)	positive
Bothriochloa macra	0.2	2(2–2)	positive
Carex appressa	0.2	2(2–2)	positive
Notodanthonia monticola	0.2	2(2–2)	positive
Helichrysum scorpioides	0.2	2(2–2)	positive
Juncus filicaulis	0.2	2(2–2)	positive
Schoenus apogon	0.2	2(2–2)	positive
Scleranthus biflorus	0.2	2(2–2)	positive
Scleranthus diander	0.2	2(2–2)	positive
Acaena novae-zelandiae	0.2	1(1–1)	positive
Agrostis avenacea var. *avenacea*	0.2	1(1–1)	positive
Carex longebrachiata	0.2	1(1–1)	positive
Convolvulus erubescens	0.2	1(1–1)	positive
Crassula sieberiana	0.2	1(1–1)	positive
Notodanthonia pilosa var. *pilosa*	0.2	1(1–1)	positive
Desmodium varians	0.2	1(1–1)	positive
Enneapogon nigricans	0.2	1(1–1)	positive
Epilobium billardierianum	0.2	1(1–1)	positive
Geranium retrorsum	0.2	1(1–1)	positive
Haloragis heterophylla	0.2	1(1–1)	positive
Luzula densiflora	0.2	1(1–1)	positive
Oreomyrrhis eriopoda	0.2	1(1–1)	positive
Ranunculus lappaceus	0.2	1(1–1)	positive
Swainsona behriana	0.2	1(1–1)	positive
Vittadinia muelleri	0.2	1(1–1)	positive
Wahlenbergia communis	0.2	1(1–1)	positive

Table 23Ab. Vegetation structure of Map Unit 23A. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=5).

Stratum	Frequency	Height (m)	Cover (%)
Tree	0	-	-
Small tree	0	-	-
Shrub	0	-	-
Ground cover	100	0.5(0.1)	81(6)

Table 23Ac. Habitat characteristics of Map Unit 23A. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		-	-	0
Altitude (m)		982	930–1020	5
Slope (degrees)		3	2–5	5
Terrain class				
North	0			0
Intermediate	20			1
South	20			1
Flat	60			3
Parent material				
Devonian granitoids	40			2
Tertiary Basalt	60			3



Map 23A. Distribution of samples of Monaro Grassland (Map Unit 23A) shown by large black squares. Samples of other map units shown as small grey points.

Plate 23A. Monaro Grassland (Map Unit 23A) remnant dominated by *Poa labillardieri* at Black Lake, west of Cathcart.

Map Unit 23B: Monaro Basalt Grass Woodland

Monaro Basalt Grass Woodland is dominated by *Eucalyptus pauciflora* and *E. viminalis* c. 15 m tall. Scattered shrubs of *Acacia melanoxylon* emerge from a continuous grassy groundcover dominated by *Themeda australis, Poa labillardieri* and *Sorghum leiocladum* and a rich and variable component of forbs including *Acaena nova-zelandiae, Asperula conferta, Chrysocephalum apiculatum* and *Cullen microcephalum*. Monaro Basalt Grass Woodland occurs on relatively well-drained undulating basalt terrain north from Bombala on low-rainfall (generally < 800 mm annual precipitation) parts of the Monaro Tableland. This assemblage is part of a complex of grassy assemblages (Map Units 22–24) on the Monaro Tableland rainshadow area and is distinguished by the rich herbaceous-grassy understorey and relative scarcity of shrubs. With increasing rainfall, it grades into Basalt Wet Herb Forest (Map Unit 16). Nearly 90% of Monaro Basalt Grass Woodland has been cleared for agriculture. The remainder is highly fragmented and occurs mainly on private land where further clearing is the principal threat, although continuing weed invasion and overgrazing in dry periods are likely to cause a loss of groundcover diversity in stands that escape clearing. Similar vegetation is found elsewhere on the Monaro Tableland, particularly to the north-west around Cooma (Costin 1954). A similar highly depleted assemblage, described as one of two floristic entities within Ecological Vegetation Class 37 (Woodgate et al. 1994), occurs on Honeysuckle Range, west of Bonang in East Gippsland.

Species richness: 17 ± 3 (0.04 ha)
Extant area: 3395 ha
Proportion cleared: 86%
Number of samples: 14

Table 23Ba. Diagnostic plant species of Map Unit 23B.

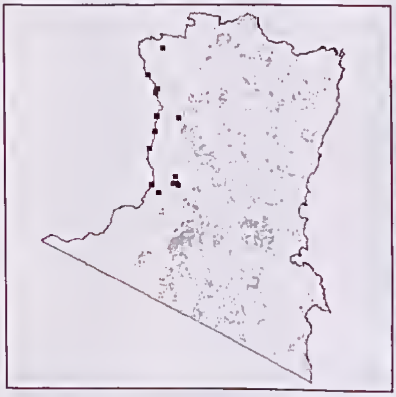
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acaena novae-zelandiae	0.5	2(2–2)	0.128	1(1–2)	positive
Asperula conferta	0.786	2(2–3)	0.021	1(1–1)	positive
Bothriochloa macra	0.071	3(3–3)	0	0(0–0)	positive
Chrysocephalum apiculatum	0.357	2(2–3)	0	0(0–0)	positive
Discaria pubescens	0.143	1(1–1)	0	0(0–0)	positive
Eucalyptus pauciflora	0.643	3(2–3)	0.017	1(1–3)	positive
Festuca asperula	0.071	1(1–1)	0	0(0–0)	positive
Leptorhynchos squamatus	0.143	1(1–1)	0	0(0–0)	positive
Poa sieberiana var. *sieberiana*	0.714	3(3–4)	0.064	1(1–2)	positive
Cullen microcephalum	0.5	2(1–2)	0.001	1.5(1–2)	positive
Sorghum leiocladum	0.286	1(1–2)	0	0(0–0)	positive
Austrostipa blackii	0.071	1(1–1)	0	0(0–0)	positive
Themeda australis	0.857	3(2–3)	0.107	2(1–3)	positive
Trachymene humilis	0.071	1(1–1)	0	0(0–0)	positive
Wahlenbergia planiflora subsp. *planiflora*	0.143	1(1–1)	0	0(0–0)	positive
Acacia melanoxylon	0.357	1(1–1)	0.103	1(1–3)	uninformative
Eucalyptus cypellocarpa	0.071	3(3–3)	0.316	3(2–3)	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.071	3(3–3)	0.018	2.5(1–3)	uninformative
Eucalyptus radiata	0.071	3(3–3)	0.077	3(1–3)	uninformative
Eucalyptus stellulata	0.143	2.5(2–3)	0.001	1(1–1)	uninformative
Eucalyptus viminalis	0.429	3(3–3)	0.054	3(1–3)	uninformative
Lomandra longifolia	0.071	1(1–1)	0.554	2(1–2)	negative
Poa meionectes	0.357	3(3–4)	0.541	2(1–3)	negative
Pteridium esculentum	0	0(2–0)	0.582	2(1–3)	negative

Table 23Bb. Vegetation structure of Map Unit 23B. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=5).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	16.4(3.9)	17(3)
Small tree	0	-(-)	-(-)
Shrub	80	3.6(1.0)	11(6)
Ground cover	100	0.6(0.1)	49(11)

Table 23Bc. Habitat characteristics of Map Unit 23B. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		762	732–790	14
Altitude (m)		938	823–1070	14
Slope (degrees)		9	3–11	6
Terrain class				
North	0			0
Intermediate	17			1
South	33			2
Flat	50			3
Parent material				
Ordovician high quartz sedimentaries	14			2
Tertiary Alluvium	7			1
Tertiary Basalt	79			11



Map 23B. Distribution of samples of Monaro Basalt Grass Woodland (Map Unit 23B) shown by large black squares. Samples of other map units shown as small grey points.

Plate 23B. Monaro Basalt Grass Woodland (Map Unit 23B) remnant dominated by *Eucalyptus stellulata* and *E. pauciflora* with a grazed grassy understorey comprising *Bothriochloa macra*, *Poa* spp. and various forbs near Nimmitabel tip.

Map Unit 24: Subalpine Dry Shrub Forest

Subalpine Dry Shrub Forest has a variable tree stratum up to 20 m tall, usually dominated by *Eucalyptus dalrympleana* and *E. radiata*, with *E. pauciflora*, *E. viminalis* or *E. dives* in varying proportions. Scattered shrubs of *Acacia dealbata* emerge from a stratum of smaller shrubs including *Monotoca scoparia*, *Bossiaea foliosa*, *Podolobium procumbens* or *Persoonia chamaepeuce*. The groundcover includes tussocks of *Poa meionectes*, *P. sieberiana* and *Lomandra longifolia* and scattered forbs such as *Gonocarpus tetragynus*. Subalpine Dry Shrub Forest is a variable unit extending across the Monaro Tableland from the western edge of the escarpment range as a major component of the complex of grassy assemblages (Map Units 22–24) in that rainshadow area. It typically occurs on gentle terrain above 700 m elevation on granitoid substrates or metasediments. Near the escarpment range *E. radiata* is most common and the assemblage is restricted to frost hollows associated with Subalpine Bogs (Map Unit 59). Further west, the stands are more extensive, *E. pauciflora* becomes more dominant and the graminoid component of the understorey increases. Similar assemblages occur elsewhere on the Monaro Tableland (Costin 1954). In East Gippsland *E. radiata* and *E. dalrympleana* dominate 'better watered lower altitude' stands of Ecological Vegetation Class 36 (Woodgate et al. 1994), although some understorey components may differ. Approximately three-quarters of this extensive unit has been cleared for agriculture and although much of the remainder occurs on private land, there are significant stands in reserves and State Forest on the western edge of the escarpment range. The principal threats include further clearing (on private land), grazing, associated weed invasion and loss of shrub diversity in stands subject to frequent fire regimes.

Species richness: 26 ± 2 (0.04 ha)

Extant area: 26 520 ha

Proportion cleared: 72%

Number of samples: 32

Table 24a. Diagnostic plant species of Map Unit 24.

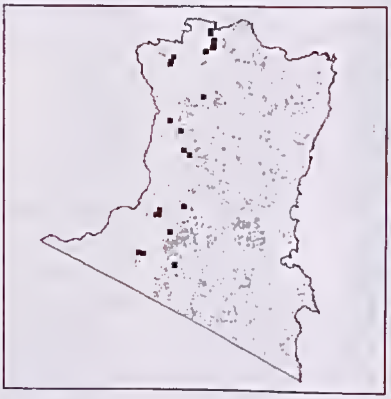
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Eucalyptus dalrympleana subsp. *dalrympleana*	0.5	3(2–3)	0.012	2(1–3)	positive
Eucalyptus radiata	0.5	3(2–3)	0.071	3(1–3)	positive
Gonocarpus tetragynus	0.6	2(1–2)	0.16	2(1–2)	positive
Monotoca scoparia	0.55	2(2–3)	0.12	2(1–2)	positive
Lomandra longifolia	0.7	2(2–3)	0.547	2(1–2)	frequent
Poa meionectes	0.7	2.5(2–4)	0.537	2(1–3)	frequent
Acacia dealbata	0.35	1(1–2)	0.135	2(1–3)	uninformative
Bossiaea foliosa	0.45	3(2–4)	0.012	1(1–2)	uninformative
Eucalyptus cypellocarpa	0.15	2(1–3)	0.316	3(2–3)	uninformative
Eucalyptus dives	0.35	3(3–3)	0.006	3(1–3)	uninformative
Eucalyptus fastigata	0.05	1(1–1)	0.142	3(3–4)	uninformative
Eucalyptus globoidea	0.05	2(2–2)	0.245	3(1–3)	uninformative
Eucalyptus obliqua	0.05	3(3–3)	0.192	3(2–4)	uninformative
Eucalyptus ovata	0.1	2(2–2)	0.022	3(1–3)	uninformative
Eucalyptus pauciflora	0.45	2(1–3)	0.017	2(1–3)	uninformative
Eucalyptus rubida	0.1	2(1–3)	0.006	1(1–3)	uninformative
Eucalyptus sp. aff. *radiata*	0.05	3(3–3)	0.035	3(2–3)	uninformative
Eucalyptus stellulata	0.05	1(1–1)	0.001	2.5(2–3)	uninformative
Eucalyptus viminalis	0.45	3(3–4)	0.052	3(1–3)	uninformative
Podolobium procumbens	0.3	1.5(1–2)	0.007	2(1–2)	uninformative
Persoonia chamaepeuce	0.3	1(1–2)	0.007	1.5(1–2)	uninformative
Poa sieberiana	0.3	3(3–4)	0.014	1(1–3)	uninformative
Pteridium esculentum	0.25	2(1–2)	0.581	2(1–3)	negative

Table 24b. Vegetation structure of Map Unit 24. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=15).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	18.6(1.3)	29(2)
Small tree	6.7	10.0(-)	10(-)
Shrub	100	1.7(0.2)	28(5)
Ground cover	100	0.3(0.0)	32(7)

Table 24c. Habitat characteristics of Map Unit 24. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		846	787–917	32
Altitude (m)		924	785–1020	30
Slope (degrees)		8	2–11	30
Terrain class				
North	7			2
Intermediate	30			9
South	17			5
Flat	47			14
Parent material				
Devonian granitoids	53			17
Devonian high quartz sedimentaries	6			2
Low quartz sedimentaries	13			4
Ordovician high quartz sedimentaries	22			7
Tertiary Basalt	6			2



Map 24. Distribution of samples of Subalpine Dry Shrub Forest (Map Unit 24) shown by large black squares. Samples of other map units shown as small grey points.

Plate 24. Subalpine Dry Shrub Forest (Map Unit 24) dominated by *Eucalyptus pauciflora, E. dalrympleana* and *E. radiata* with *Gahnia subaequiglumis* and *Bossiaea foliosa* adjacent to Nunnock Swamp, Tantawangalo section, South East Forests National Park.

Map Unit 25: Sandstone Dry Shrub Forest

Sandstone Dry Shrub Forest is c. 20 m tall and dominated by *Eucalyptus obliqua* and *E.* sp. aff. *radiata* (a variant with broader, more glaucous juvenile leaves than the type form), often with *E. sieberi*. A prominent sclerophyllous shrub stratum includes *Acacia mucronata, Epacris impressa, Platysace lanceolata, Lomatia ilicifolia* and *Oxylobium arborescens* or *Persoonia chamaepeuce*. The relatively dense groundcover is dominated by bracken, *Pteridium esculentum* and wiregrass, *Tetrarrhena juncea*, with other grasses and graminoids, notably *Lomandra longifolia* and *Poa meionectes*, and herbs including *Amperea xiphoclada, Dianella tasmanica, Viola hederacea* and *Gonocarpus teucrioides*. Sandstone Dry Shrub Forest is restricted to elevated ridges on the Genoa sandstone and nearby sites on quartz-rich granitoid substrates and metasediments, usually above 700 m elevation. Although about one-quarter of its distribution has been cleared for pine plantations, the principal occurrences on Nungatta Mountain and Mt Tennyson are represented within conservation reserves. Future clearing is therefore unlikely to pose a significant threat. Frequent fire regimes that reduce diversity by interrupting life-cycle processes of woody species are likely to be the main threat to this assemblage. The high densities of *P. esculentum, T. juncea* and *A. mucronata* may reflect the passage of a high intensity fire that burnt almost the entire range of Sandstone Dry Shrub Forest in 1983. Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided. Although no similar assemblage has been described in East Gippsland (Forbes et al. 1982), one may occur within the Shrubby Dry Forest complex (Ecological Vegetation Class 21, Woodgate et al. 1994) on nearby elevated sandstone areas such as Mt Coopracambra.

Species richness: 22 ± 1 (0.04 ha)

Extant area: 821 ha

Proportion cleared: 28%

Number of samples: 10

Table 25a. Diagnostic plant species of Map Unit 25.

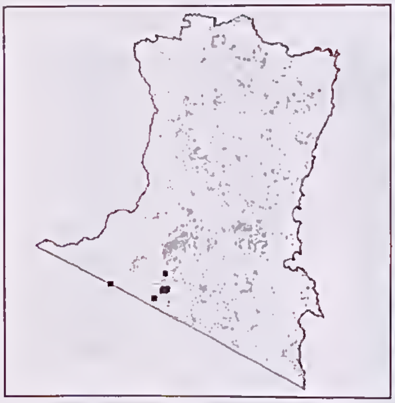
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia mucronata	0.8	4(2–4)	0.049	1(1–3)	positive
Amperea xiphoclada	0.6	2(1–2)	0.057	1(1–2)	positive
Dianella tasmanica	0.5	2(2–3)	0.233	1(1–2)	positive
Epacris impressa	0.9	3(2–3)	0.192	2(1–2)	positive
Eucalyptus obliqua	0.7	3(1–3)	0.186	3(2–4)	positive
Eucalyptus sp. aff. *radiata*	0.5	3(2–3)	0.032	3(2–3)	positive
Platysace lanceolata	0.9	2(2–3)	0.247	2(1–2)	positive
Tetrarrhena juncea	0.5	2(2–3)	0.18	2(1–3)	positive
Viola hederacea subsp. *hederacea*	0.5	2(1–2)	0.437	2(1–2)	positive
Lomandra longifolia	1	3(3–4)	0.546	2(1–2)	frequent
Poa meionectes	0.7	2(1–4)	0.538	2(1–3)	frequent
Pteridium esculentum	0.8	2.5(2–4)	0.575	2(1–3)	frequent
Gonocarpus teucrioides	0.6	1.5(1–2)	0.314	2(1–2)	frequent
Lomatia ilicifolia	0.8	1(1–1)	0.127	1(1–2)	frequent
Oxylobium arborescens	0.6	1.5(1–3)	0.014	2(1–3)	frequent
Eucalyptus angophoroides	0.1	3(3–3)	0.044	2(1–3)	uninformative
Eucalyptus consideniana	0.1	4(4–4)	0.021	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.2	3(3–3)	0.315	3(2–3)	uninformative
Eucalyptus elata	0.1	3(3–3)	0.113	3(2–3)	uninformative
Eucalyptus globoidea	0.1	2(2–2)	0.244	3(1–3)	uninformative
Eucalyptus mackintii	0.1	4(4–4)	0.003	3(3–4)	uninformative
Eucalyptus radiata	0.2	2(2–2)	0.076	3(1–3)	uninformative
Eucalyptus sieberi	0.4	3(2–4)	0.282	3(2–4)	uninformative

Table 25b. Vegetation structure of Map Unit 25. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=10).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	21.4(2.1)	30(4)
Small tree	0	-(-)	-(-)
Shrub	100	1.6(0.2)	38(6)
Ground cover	100	0.5(0.1)	44(6)

Table 25c. Habitat characteristics of Map Unit 25. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°). Note extreme values for one sample have been ommitted from the annual rain (955 mm) and altitude (380 m) summary statistics.

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1200	1193–1230	9
Altitude (m)		850	830–980	9
Slope (degrees)		6	2–7	10
Terrain class				
North	10			1
Intermediate	40			4
South	0			0
Flat	50			5
Parent material				
Devonian granitoids	10			1
Devonian high quartz sedimentaries	80			8
Ordovician high quartz sedimentaries	10			1



Map 25. Distribution of samples of Sandstone Dry Shrub Forest (Map Unit 25) shown by large black squares. Samples of other map units shown as small grey points.

Plate 25. Sandstone Dry Shrub Forest (Map Unit 25) dominated by *Eucalyptus obliqua, E. sieberi* and *E.* sp. aff. *radiata* with *Acacia mucronata, Ozothamnus cuneifolius* and *Persoonia brevifolia* on Nungatta Plateau, Genoa section, South East Forests National Park.

Map Unit 26: Tableland Dry Shrub Forest

Tableland Dry Shrub Forest is dominated by *Eucalyptus globoidea, E. radiata* and *E. cypellocarpa* up to 30 m tall. An open sclerophyllous shrub stratum is dominated by Epacridaceae: *Epacris impressa; Leucopogon lanceolatus;* and *Monotoca scoparia,* with *Hibbertia obtusifolia.* The groundcover is relatively sparse and includes grasses and graminoids *Dichelachne rara, Lomandra longifolia, Microlaena stipoides* and *Poa meionectes,* herbs *Gonocarpus tetragynus, Viola hederacea* and *Dianella caerulea* and bracken, *Pteridium esculentum.* Tableland Dry Shrub Forest occurs on ridges and dry slopes on metasediments and granitoid substrates at 300–850 m elevation in the south-western part of the study area. Forbes et al. (1982) described a similar assemblage (Community 9.3) scattered through the foothills of East Gippsland, but this differs in some compositional aspects (e.g. low frequency of *E. radiata*). About two-fifths of Tableland Dry Shrub Forest has been cleared, mainly for pine plantation and about two-thirds of the remainder occurs on State Forest and private land available for logging. Although a further 3200 ha of this vegetation is potentially threatened by further clearing, the principal threat to stands outside reserves is frequent disturbance regimes that include logging and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 32± 2 (0.04 ha)
Extant area: 16 080 ha
Proportion cleared: 43%
Number of samples: 34

Table 26a. Diagnostic plant species of Map Unit 26.

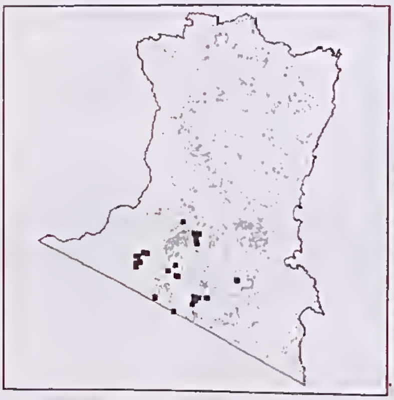
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Dichelachne rara	0.5	2(1–2)	0.162	1(1–2)	positive
Epacris impressa	0.853	2(1–2)	0.181	2(1–2)	positive
Eucalyptus cypellocarpa	0.5	3(2–3)	0.31	3(2–3)	positive
Eucalyptus globoidea	0.677	3(2–3)	0.232	3(1–3)	positive
Eucalyptus radiata	0.588	3(2–3)	0.065	3(1–3)	positive
Gonocarpus tetragynus	0.5	2(1–2)	0.158	2(1–2)	positive
Helichrysum rutidolepis	0.029	2(2–2)	0	0(0–0)	positive
Leucopogon lanceolatus var. *lanceolatus*	0.824	2(1–2)	0.396	1(1–2)	positive
Microtis parviflora	0.029	1(1–1)	0	0(0–0)	positive
Viola hederacea subsp. *hederacea*	0.588	2(1–2)	0.434	2(1–2)	positive
Lomandra longifolia	1	2(2–2)	0.538	2(1–2)	frequent
Poa meionectes	0.971	2(2–3)	0.529	2(1–3)	frequent
Pteridium esculentum	0.677	2(2–3)	0.574	2(1–3)	frequent
Dianella caerulea	0.882	1(1–2)	0.264	1(1–2)	frequent
Hibbertia obtusifolia	0.677	1(1–2)	0.073	1(1–2)	frequent
Microlaena stipoides var. *stipoides*	0.647	1(1–2)	0.347	2(1–2)	frequent
Monotoca scoparia	0.618	1(1–2)	0.114	2(1–2)	frequent
Eucalyptus angophoroides	0.265	3(2–4)	0.039	2(1–3)	uninformative
Eucalyptus croajingolensis	0.059	3(3–3)	0.001	2(2–2)	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.177	2.5(1–3)	0.015	3(1–3)	uninformative
Eucalyptus dives	0.029	3(3–3)	0.01	3(2–3)	uninformative
Eucalyptus elata	0.029	1(1–1)	0.115	3(2–3)	uninformative
Eucalyptus mackintii	0.029	3(3–3)	0.003	3(3–4)	uninformative
Eucalyptus muelleriana	0.029	3(3–3)	0.145	3(2–4)	uninformative
Eucalyptus obliqua	0.265	3(2–3)	0.188	3(2–4)	uninformative
Eucalyptus ovata	0.059	1(1–1)	0.022	3(1–3)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.029	1(1–1)	0.014	2(2–3)	uninformative
Eucalyptus sieberi	0.235	3(2–3)	0.284	3(2–4)	uninformative
Eucalyptus sp. aff. *radiata*	0.088	4(3–4)	0.034	3(2–3)	uninformative
Eucalyptus viminalis	0.206	1(1–3)	0.054	3(1–3)	uninformative

Table 26b. Vegetation structure of Map Unit 26. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=29).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	28.6(1.0)	29(2)
Small tree	37.9	8.0(0.9)	18(3)
Shrub	100	2.1(0.2)	27(4)
Ground cover	100	0.5(0.0)	18(2)

Table 26c. Habitat characteristics of Map Unit 26. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		972	944–1002	34
Altitude (m)		549	383–714	34
Slope (degrees)		8	3–10	34
Terrain class				
North	21			7
Intermediate	29			10
South	18			6
Flat	32			11
Parent material				
Devonian granitoids	74			25
Devonian high quartz sedimentaries	9			3
Ordovician high quartz sedimentaries	18			6

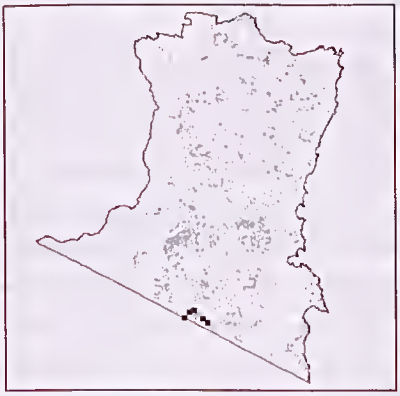


Map 26. Distribution of samples of Tableland Dry Shrub Forest (Map Unit 26) shown by large black squares. Samples of other map units shown as small grey points.

Plate 26. Nalbaugh Dry Grass Forest (Map Unit 26) dominated by *Eucalyptus viminalis* and *E. angophoroides* with *Acacia dealbata*, *Poa meionectes*, *Lomandra longifolia* and *Gahnia sieberiana* near Walla Walla Creek, Waalimma section of South East Forests National Park.

Map Unit 27: Waalimma Dry Grass Forest

Waalimma Dry Grass Forest has a variable tree stratum dominated by *Eucalyptus angophoroides*, *E. globoidea*, *E. sieberi*, *E. tricarpa* and *E. polyanthemos* in various combinations. Trees are up to 25 m tall. A sclerophyllous shrub stratum includes *Acacia mucronata*, *Epacris impressa* and *Pultenaea scabra*, while the rich and distinctive grassy understorey is dominated by *Themeda australis* and graminoids, *Gahnia radula, Lomandra multiflora* and *Lepidosperma laterale*, with small shrubs, *Astroloma humifusum, Lissanthe strigosa* and *Hibbertia obtusifolia*, and herbs *Gonocarpus tetragynus, Helichrysum scorpioides, Bossiaea prostrata, Hypericum gramineum, Viola hederacea* and *Dianella* spp. and the twiner, *Billardiera scandens*. Waalimma Dry Grass Forest occurs on broad ridges and upper slopes on metasediments and granitoid substrates at 350–500 m elevation. It has a highly restricted distribution around Mt Waalimma close to the Victorian border, primarily on State Forest. Forbes et al. (1982) recorded a similar assemblage on adjacent sites across the Victorian border (Box-Ironbark Woodland, Community 10.1). However, these stands appear to differ substantially in composition and habitat from other stands attributed to Box-Ironbark elsewhere in the foothills of East Gippsland. Foothill Box-Ironbark Forest (Ecological Vegetation Class 24) described by Woodgate et al. (1994) shares two tree species (*E. polyanthemos* and *E. tricarpa*) with Waalimma Dry Grass Forest, but has a structurally different shrubby understorey (cf. grassy) with none of the major species in common. The Victorian assemblage occurs in two highly restricted stands (c. 600 ha) on limestone and metasediments (Woodgate et al. 1994). It therefore seems unlikely that Waalimma Dry Grass Forest occurs in Victoria beyond areas adjacent to the border. The principal threat facing Waalimma Dry Grass Forest is high frequency disturbance regimes associated with timber production. The largest area of this vegetation includes tree stands of post-1952 fire regrowth which are scheduled for intensive silvicultural management for thinnings and sawlog production in the first decades of the twenty-first century. Frequent disturbance regimes including logging, thinning and burning may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity from this distinctive, species-rich assemblage are to be avoided.



Map 27. Distribution of samples of Waalimma Dry Grass Forest (Map Unit 27) shown by large black squares. Samples of other map units shown as small grey points.

Plate 27. Waalimma Dry Grass Forest (Map Unit 27) dominated by *Eucalyptus tricarpa, E. angophoroides* and *E. globoidea* with *Acacia mucronata, A. stricta, Lissanthe strigosa, Gahnia radula* and *Echinopogon ovatus* on the northern toeslope of Mt Waalimma, Waalimma section, South East Forest National Park.

Species richness: 38 ± 2 (0.04 ha)
Extant area: 1324 ha
Proportion cleared: 0%
Number of samples: 5

Table 27a. Diagnostic plant species of Map Unit 27.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia mucronata	0.6	3(1–3)	0.052	1(1–3)	positive
Astroloma humifusum	1	2(1–4)	0.05	1(1–2)	positive
Epacris impressa	0.6	3(3–3)	0.195	2(1–2)	positive
Eucalyptus angophoroides	0.8	2.5(1–3)	0.042	2(1–3)	positive
Eucalyptus globoidea	0.8	2(2–3)	0.241	3(1–3)	positive
Eucalyptus sieberi	0.6	2(1–3)	0.282	3(2–4)	positive
Eucalyptus tricarpa	0.6	3(3–4)	0.02	2(1–3)	positive
Gahnia radula	1	3(3–4)	0.088	2(1–3)	positive
Gonocarpus tetragynus	0.6	2(2–2)	0.164	2(1–2)	positive
Helichrysum scorpioides	0.8	2(1–2)	0.13	1(1–2)	positive
Lepidosperma laterale	1	2(1–2)	0.342	1(1–2)	positive
Lissanthe strigosa	1	2(1–3)	0.009	1(1–3)	positive
Lomandra filiformis subsp. *flavior*	0.6	2(1–3)	0.017	1(1–2)	positive
Pultenaea scabra var. *scabra*	0.6	2(1–3)	0.005	2(1–3)	positive
Themeda australis	1	2(1–3)	0.111	2(1–3)	positive
Billardiera scandens	0.8	1.5(1–2)	0.327	1(1–1)	frequent
Bossiaea prostrata	0.8	1.5(1–2)	0.027	1(1–1)	frequent
Burchardia umbellata	0.6	1(1–1)	0.019	1(1–2)	frequent
Deyeuxia quadriseta	0.6	1(1–1)	0.041	1(1–1)	frequent
Dianella caerulea	0.8	1.5(1–2)	0.277	1(1–2)	frequent
Dianella revoluta var. *revoluta*	0.6	1(1–2)	0.08	1(1–1)	frequent
Dichelachne micrantha	0.6	1(1–2)	0.084	1(1–2)	frequent
Dichelachne rara	0.6	1(1–2)	0.168	1(1–2)	frequent
Eucalyptus polyanthemos subsp. *vestita*	0.6	1(1–3)	0.011	2.5(2–3)	frequent
Hibbertia empetrifolia	0.6	1(1–2)	0.063	1(1–2)	frequent
Hypericum gramineum	0.8	1(1–2)	0.24	1(1–2)	frequent
Lomandra multiflora	1	1(1–2)	0.249	1(1–2)	frequent
Eucalyptus agglomerata	0.4	2(1–3)	0.108	3(2–3)	uninformative
Eucalyptus bosistoana	0.2	4(4–4)	0.052	2(1–3)	uninformative
Lomandra longifolia	0.4	2(1–3)	0.549	2(1–2)	negative
Poa meionectes	0.4	3.5(3–4)	0.539	2(1–3)	negative
Pteridium esculentum	0.2	1(1–1)	0.578	2(1–3)	negative

Table 27b. Vegetation structure of Map Unit 27. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=5).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	22.6(2.2)	25(3)
Small tree	20	12.0(-)	20(-)
Shrub	100	1.6(0.2)	29(7)
Ground cover	100	0.5(0.0)	58(6)

Table 27c. Habitat characteristics of Map Unit 27. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1036	1018–1040	5
Altitude (m)		405	370–405	5
Slope (degrees)		8	6–9	5
Terrain class				
North	20			1
Intermediate	40			2
South	40			2
Flat	0			0
Parent material				
Devonian granitoids	60			3
Ordovician high quartz sedimentaries	40			2

Map Unit 28: Wog Wog Dry Grass Forest

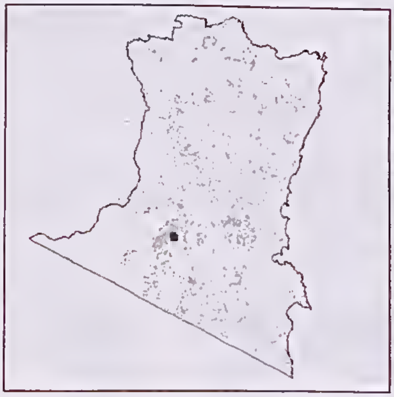
Wog Wog Dry Grass Forest is dominated by *Eucalyptus agglomerata*, and *E. maidenii*, occasionally with *E. angophoroides* up to 30 m tall. A sparse cover of sclerophyllous shrubs includes *Leucopogon lanceolatus*, *Hibbertia obtusifolia* and *Senecio linearifolius*. The species-rich, semi-continuous groundcover is dominated by grasses and graminoids *Poa meionectes*, *Agrostis avenacea* and *Notodanthonia pilosa*, with a rich array of herbs including *Ajuga australis*, *Geranium potentilloides*, *Poranthera microphylla*, *Viola hederacea*, *Acaena nova-zelandiae*, *Desmodium varians*, *Gonocarpus teucrioides*, *Hydrocotyle acutiloba*, *Hypericum gramineum*, *Oxalis perennans*, *Plantago debilis* and *Wahlenbergia* spp. The groundcover also includes prostrate shrubs of *Astroloma humifusum* and twining plants of *Glycine clandestina*. Wog Wog Dry Grass Forest is restricted to gentle lower slopes on granitoid substrates at 400–500 m elevation in the Wog Wog Creek area. No similar assemblages have been described outside the Eden region (Austin 1978, Woodgate et al. 1994). About one third of Wog Wog Dry Grass Forest has been cleared for agriculture and is now under pine plantation. Most of the remainder is in a national park, where fire regimes and feral pigs are the main management concerns. Diggings of feral pigs, which have been present in appreciable numbers in this area, potentially threaten the groundcover with loss of diversity and weed invasion.

Species richness: 34 ± 2 (0.1 ha)
Extant area: 922 ha
Proportion cleared: 29%
Number of samples: 10

Table 28a. Diagnostic plant species of Map Unit 28.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Ajuga australis	0.5	2(2–2)	0.04	1(1–1)	positive
Eucalyptus agglomerata	0.9	3(3–4)	0.103	3(2–3)	positive
Eucalyptus maidenii	0.9	3(2–3)	0.057	3(3–3)	positive
Geranium potentilloides	0.6	2(1–2)	0.213	1(1–2)	positive
Leptospermum parvifolium	0.2	3(2–4)	0	0(0–0)	positive

Species	**Target frequency**	**Target C/A**	**Residual frequency**	**Residual C/A**	**Fidelity class**
Poranthera microphylla	0.9	2(1–2)	0.219	1(1–1)	positive
Viola hederacea subsp. *hederacea*	0.7	2(1–2)	0.436	2(1–2)	positive
Poa meionectes	1	5(4–6)	0.536	2(1–3)	frequent
Acaena novae-zelandiae	0.7	1(1–1)	0.128	1(1–2)	frequent
Agrostis avenacea	0.7	1(1–2)	0.023	1(1–1)	frequent
Astroloma humifusum	0.8	1(1–2)	0.048	1(1–2)	frequent
Notodanthonia pilosa var. *pilosa*	0.8	1(1–2)	0.06	1(1–1)	frequent
Desmodium varians	0.7	1(1–1)	0.247	1(1–2)	frequent
Glycine clandestina	0.7	1(1–2)	0.325	1(1–2)	frequent
Gonocarpus teucrioides	0.8	1(1–2)	0.313	2(1–2)	frequent
Hibbertia obtusifolia	0.6	1(1–2)	0.083	1(1–2)	frequent
Hydrocotyle acutiloba	0.9	1(1–2)	0.192	1(1–2)	frequent
Hypericum gramineum	0.8	1(1–2)	0.238	1(1–2)	frequent
Lagenifera stipitata	0.8	1.5(1–2)	0.321	1(1–2)	frequent
Leucopogon lanceolatus var. *lanceolatus*	1	1.5(1–2)	0.402	1(1–2)	frequent
Lomandra multiflora	0.6	1(1–2)	0.249	1(1–2)	frequent
Oxalis perennans	0.7	1(1–2)	0.219	1(1–1)	frequent
Plantago debilis	0.7	1(1–2)	0.109	1(1–1)	frequent
Senecio linearifolius	0.9	1(1–2)	0.235	1(1–2)	frequent
Senecio sp. E	0.6	1(1–2)	0.19	1(1–2)	frequent
Wahlenbergia gracilis	0.6	1(1–1)	0.135	1(1–1)	frequent
Wahlenbergia stricta subsp. *stricta*	0.7	1(1–2)	0.069	1(1–1)	frequent
Eucalyptus angophoroides	0.4	1(1–3)	0.042	2(1–3)	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.1	1(1–1)	0.018	3(1–3)	uninformative
Eucalyptus elata	0.1	2(2–2)	0.113	3(2–3)	uninformative
Eucalyptus globoidea	0.1	4(4–4)	0.244	3(1–3)	uninformative
Eucalyptus muelleriana	0.1	1(1–1)	0.142	3(2–4)	uninformative
Eucalyptus sieberi	0.1	2(2–2)	0.284	3(2–4)	uninformative
Lomandra longifolia	0.4	2.5(1–3)	0.55	2(1–2)	negative
Pteridium esculentum	0.4	2(1–2)	0.578	2(1–3)	negative



Map 28. Distribution of samples of Wog Wog Dry Grass Forest (Map Unit 28) shown by large black squares. Samples of other map units shown as small grey points.

Plate 28. Wog Wog Dry Grass Forest (Map Unit 24) dominated by *Eucalyptus maidenii* and *E. agglomerata* with *Leucopogon lanceolatus*, *Poa meionectes* and *Pteridium esculentum* on Conga Road near Wog Wog River, Coolangubra section, South East Forests National Park.

Table 28b. Vegetation structure of Map Unit 28. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=10).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	28.5(1.1)	34(3)
Small tree	30	6.3(0.9)	11(5)
Shrub	100	2.5(0.4)	14(5)
Ground cover	100	0.4(0.1)	69(8)

Table 28c. Habitat characteristics of Map Unit 28. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		920	916–927	10
Altitude (m)		467	453–480	10
Slope (degrees)		9	8–10	10
Terrain class				
North	10			1
Intermediate	50			5
South	30			3
Flat	10			1
Parent material				
Devonian granitoids	100			10

Map Unit 29: Nalbaugh Dry Grass Forest

Nalbaugh Dry Grass Forest is dominated by *Eucalyptus globoidea* and *E. cypellocarpa* over 25 m tall, occasionally with *E.* sp. aff. *radiata, E. ovata* or *E. sieberi.* An open shrub stratum is dominated by *Cassinia aculeata* with *Epacris impressa* and *Leucopogon lanceolatus.* The groundcover has a moderate density and comprises grasses and graminoids *Lomandra longifolia, Poa meionectes, Microlaena stipoides* and *Luzula flaccida,* and with a diverse compliment of forbs including *Gonocarpus tetragynus, Viola hederacea, Geranium potentilloides, Helichrysum scorpioides, Hydrocotyle acutiloba, Lagenifera stipitata, Poranthera microphylla* and *Senecio* sp. E. Nalbaugh Dry Grass Forest occurs on lower granitoid slopes at 500–850 m elevation on the southern part of the escarpment range. It differs from Tableland Dry Shrub Forest (Map Unit 26) in its subdominant tree species and the greater diversity of forbs in its more developed groundcover. Its composition does not readily match any of the assemblages described in adjacent regions (Austin 1978, Forbes et al. 1982), however, there may be restricted occurrences within the Grassy Dry Forest complex in East Gippsland (Woodgate et al. 1994). One-quarter of Nalbaugh Dry Grass Forest has been cleared and three-fifths of the remainder occurs on State Forest and private land available for logging. The principal threat to stands outside reserves is frequent disturbance regimes that include logging and fire in combination, although the impact of these regimes is likely to be less severe than in assemblages with more diverse woody components. Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 39 ± 3 (0.1 ha)
Extant area: 1937 ha
Proportion cleared: 25%
Number of samples: 17

Table 29a. Diagnostic plant species of Map Unit 29.

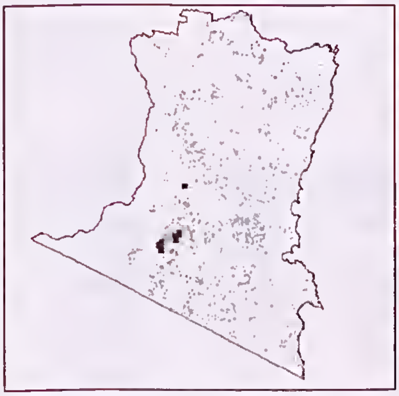
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Cassinia aculeata	0.824	2.5(1–3)	0.155	1(1–2)	positive
Dillwynia retorta	0.059	3(3–3)	0	0(0–0)	positive
Drosera glanduligera	0.059	1(1–1)	0	0(0–0)	positive
Eucalyptus cypellocarpa	0.824	3(2–4)	0.308	3(2–3)	positive
Eucalyptus globoidea	0.941	4(3–4)	0.234	3(1–3)	positive
Gonocarpus tetragynus	0.529	2(2–3)	0.162	2(1–2)	positive
Viola hederacea subsp. *hederacea*	0.765	2(1–2)	0.434	2(1–2)	positive
Lomandra longifolia	0.941	2(2–3)	0.544	2(1–2)	frequent
Poa meionectes	0.882	3(2–4)	0.535	2(1–3)	frequent
Epacris impressa	0.765	1(1–2)	0.19	2(1–2)	frequent
Geranium potentilloides	0.647	1(1–1)	0.211	1(1–2)	frequent
Helichrysum scorpioides	0.647	1(1–2)	0.126	1(1–2)	frequent
Hydrocotyle acutiloba	0.765	1(1–2)	0.19	1(1–2)	frequent
Lagenifera stipitata	0.941	1(1–2)	0.317	1(1–2)	frequent
Leucopogon lanceolatus var. *lanceolatus*	0.882	1(1–2)	0.4	1(1–2)	frequent
Luzula flaccida	0.882	1(1–1)	0.092	1(1–1)	frequent
Microlaena stipoides var. *stipoides*	0.706	1(1–2)	0.35	2(1–2)	frequent
Poranthera microphylla	0.824	1(1–2)	0.217	1(1–1)	frequent
Senecio sp. E	0.706	1(1–1)	0.187	1(1–2)	frequent
Eucalyptus maidenii	0.059	1(1–1)	0.063	3(2–3)	uninformative
Eucalyptus obliqua	0.059	1(1–1)	0.191	3(2–4)	uninformative
Eucalyptus ovata	0.294	1(1–4)	0.02	3(2–3)	uninformative
Eucalyptus radiata	0.059	3(3–3)	0.077	3(1–3)	uninformative
Eucalyptus sieberi	0.235	1(1–3)	0.283	3(2–4)	uninformative
Eucalyptus sp. aff. *radiata*	0.471	3(2–3)	0.03	3(2–3)	uninformative
Eucalyptus viminalis	0.177	3(1–4)	0.056	3(1–3)	uninformative
Pteridium esculentum	0.471	2(1–3)	0.578	2(1–3)	negative

Table 29b. Vegetation structure of Map Unit 29. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=8).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	27.1(1.5)	44(3)
Small tree	12.5	8.0(-)	20(-)
Shrub	100	3.1(0.3)	33(7)
Ground cover	100	0.4(0.1)	47(7)

Table 29c. Habitat characteristics of Map Unit 29. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		969	957–987	17
Altitude (m)		606	560–650	17
Slope (degrees)		9	4–12	17
Terrain class				
North	6			1
Intermediate	41			7
South	24			4
Flat	29			5
Parent material				
Devonian granitoids	100			17



Map 29. Distribution of samples of Nalbaugh Dry Grass Forest (Map Unit 29) shown by large black squares. Samples of other map units shown as small grey points.

Plate 29. Nalbaugh Dry Grass Forest (Map Unit 29) dominated by *Eucalyptus radiata, E. viminalis* and *E. globoidea* with *Kunzea ericoides* and *Poa meionectes* on the summit of Big Jack Mountain, Coolangubra section of South East Forests National Park.

Map Unit 30: Wallagaraugh Dry Grass Forest

Wallagaraugh Dry Grass Forest has a variable tree stratum exceeding 25 m in height, usually with *Eucalyptus cypellocarpa* and *E. globoidea,* or occasionally with *E. radiata, E. viminalis* or *E. angophoroides.* An open shrub stratum is dominated by *Acacia mearnsii* and *Exocarpos strictus,* with the former species sometimes attaining the size of small trees. The species-rich groundcover has a moderate density and comprises grasses and graminoids *Poa meionectes, Microlaena stipoides* and *Lomandra longifolia* and forbs *Dichondra repens, Viola hederacea, Hypericum gramineum, Lagenifera stipitata* and *Senecio* sp. E, twiners of *Glycine clandestina* and bracken, *Pteridium esculentum.* Wallagaraugh Dry Grass Forest is restricted to relatively small stands on lower slopes, usually on granitoid substrates at 100–500 m elevation in the southern hinterland. It generally occurs at lower elevation, extending into damper habitats than Tableland Dry Shrub Forest (Map Unit 26) and Nalbaugh Dry Grass Forest (Map Unit 29), and has a more variable composition of trees and less sclerophyllous compliment of shrub species than these other assemblages. In broad open valleys Wallagaraugh Dry Grass Forest may grade into Swamp Forest (Map Unit 59) which occupies the most low-lying waterlogged sites in the catchment. Its composition does not readily match any of the assemblages described in adjacent regions (Austin 1978, Forbes et al. 1982), however, there may be restricted occurrences within the Grassy Dry Forest complex in the foothills of East Gippsland (Woodgate et al. 1994). Almost half of Wallagaraugh Dry Grass Forest has been cleared, mainly for pine plantation and three-fifths of the remainder occurs on State Forest and private land available for logging. Stands on private land are potentially threatened by further clearing. Frequent disturbance regimes that include logging (outside reserves) and fire in combination may reduce diversity by interrupting life-cycle processes of woody species and increase rates of sedimentation. Feral pigs also pose a threat to soils and the diverse ground flora through their diggings.

Species richness: 42 ± 2 (0.04 ha)

Extant area: 914 ha

Proportion cleared: 45%

Number of samples: 17

Table 30a. Diagnostic plant species of Map Unit 30.

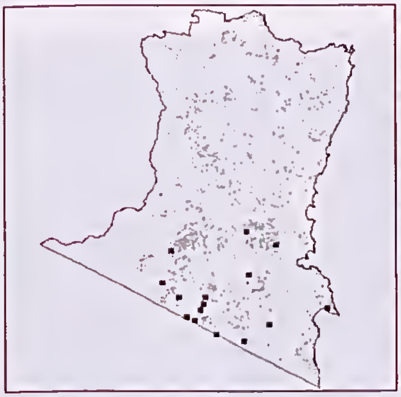
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia mearnsii	0.588	2.5(1–4)	0.158	2(1–3)	positive
Bracteantha viscosa	0.059	2(2–2)	0	0(0–0)	positive
Dichondra repens	0.647	2(1–2)	0.28	2(1–2)	positive
Eucalyptus cypellocarpa	0.647	3(2–3)	0.31	3(2–3)	positive
Eucalyptus globoidea	0.529	2(1–3)	0.239	3(1–3)	positive
Microlaena stipoides var. *stipoides*	0.765	2(1–2)	0.349	2(1–2)	positive
Pultenaea polifolia	0.059	1(1–1)	0	0(0–0)	positive
Thelymitra cyanea	0.059	1(1–1)	0	0(0–0)	positive
Viola hederacea subsp. *hederacea*	0.882	2(1–2)	0.432	2(1–2)	positive
Lomandra longifolia	0.765	2(1–5)	0.546	2(1–2)	frequent
Poa meionectes	0.882	2(1–2)	0.535	2(1–3)	frequent
Pteridium esculentum	0.706	2(1–3)	0.575	2(1–3)	frequent
Exocarpos strictus	0.647	1(1–2)	0.165	1(1–2)	frequent
Glycine clandestina	0.765	1(1–2)	0.322	1(1–2)	frequent
Hypericum gramineum	0.765	1(1–2)	0.236	1(1–2)	frequent
Lagenifera stipitata	0.824	1(1–1)	0.318	1(1–2)	frequent
Senecio sp. E	0.647	1(1–2)	0.188	1(1–2)	frequent
Angophora floribunda	0.059	1(1–1)	0.096	2(1–3)	uninformative
Eucalyptus agglomerata	0.059	1(1–1)	0.109	3(2–3)	uninformative
Eucalyptus angophoroides	0.235	2(1–3)	0.042	2(1–3)	uninformative
Eucalyptus bosistoana	0.118	3(2–4)	0.052	2(1–3)	uninformative
Eucalyptus elata	0.177	4(3–4)	0.112	3(2–3)	uninformative
Eucalyptus longifolia	0.059	4(4–4)	0.03	3(2–3)	uninformative
Eucalyptus muelleriana	0.177	3(1–3)	0.142	3(2–4)	uninformative
Eucalyptus obliqua	0.118	2(1–3)	0.19	3(2–4)	uninformative
Eucalyptus ovata	0.177	3(3–4)	0.021	2(1–3)	uninformative
Eucalyptus radiata	0.353	1(1–2)	0.074	3(1–3)	uninformative
Eucalyptus sieberi	0.059	3(3–3)	0.285	3(2–4)	uninformative
Eucalyptus viminalis	0.294	3(1–3)	0.054	3(1–3)	uninformative

Table 30b. Vegetation structure of Map Unit 30. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=11).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	26.0(3.2)	25(3)
Small tree	54.5	10.8(1.0)	24(7)
Shrub	90.9	2.5(0.4)	28(5)
Ground cover	100	0.4(0.1)	46(7)

Table 30c. Habitat characteristics of Map Unit 30. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		949	930–982	17
Altitude (m)		313	230–380	17
Slope (degrees)		8	2–11	17
Terrain class				
North	18			3
Intermediate	18			3
South	18			3
Flat	47			8
Parent material				
Devonian granitoids	65			11
Low quartz sedimentaries	12			2
Ordovician high quartz sedimentaries	18			3
Tertiary Alluvium	6			1



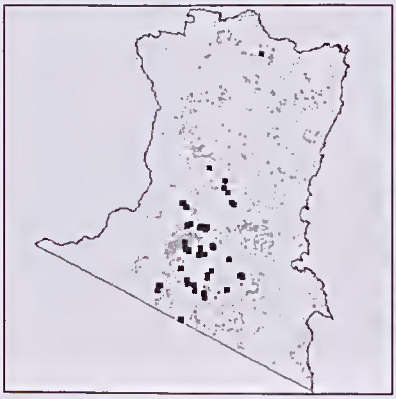
Map 30. Distribution of samples of Wallagaraugh Dry Grass Forest (Map Unit 30) shown by large black squares. Samples of other map units shown as small grey points.

Plate 30. Wallagaraugh Dry Shrub Forest (Map Unit 30) dominated by *Eucalyptus angophoroides, E. viminalis* and *E. ovata* with *Acacia longifolia, Lomandra longifolia, Poa meionectes* and *Gahnia sieberiana* on Walla Walla Creek, Waalimma section of South East Forests National Park.

Map Unit 31: Hinterland Dry Grass Forest

Hinterland Dry Grass Forest is dominated by *Eucalyptus globoidea* c. 25 m tall, and a variable compliment of other species, the most frequent of which are *E. angophoroides, E. cypellocarpa, E. maidenii* and *E. sieberi.* Scattered shrubs of *Leucopogon lanceolatus* emerge from a diverse, semi-continuous groundcover dominated by grasses and graminoids *Poa meionectes, Dichelachne rara, Microlaena stipoides, Lomandra longifolia* and *L. multiflora* with forbs including *Desmodium varians, Gonocarpus tetragynus, Hydrocotyle laxiflora, Hypericum gramineum, Viola hederacea, Gnaphalium gymnocephalum, Lagenifera stipitata, Senecio* sp. E and *Veronica calycina,* twiners of *Glycine clandestina* and bracken, *Pteridium esculentum.* Hinterland Dry Grass Forest is widespread in undulating granitoid terrain at 250–700 m elevation in the hinterland and foothills mainly south of the Bega valley. It generally occurs on drier sites than Nalbaugh Dry Grass Forest (Map Unit 29) and Wallagaraugh Dry Grass Forest (Map Unit 30) and differs in the composition of sub-dominant trees, its less developed shrub stratum and greater compliment of groundcover species. Its composition does not readily match any of the assemblages described in adjacent regions (Austin 1978, Forbes et al. 1982), however, there may be restricted occurrences within the Grassy Dry Forest complex in the foothills of East Gippsland (Woodgate et al. 1994). About 15% of Hinterland Dry Grass Forest has been cleared, but large areas remain on all tenures. Stands on private land are potentially threatened by further clearing. Frequent disturbance regimes that include logging (outside reserves) and fire in combination may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996), changing the relative abundance of eucalypt species (Bridges 1983) and increasing rates of sedimentation. These impacts are most severe for assemblages with larger components of woody species and those more topographically restricted to lower slopes.

Species richness: 38 ± 1 (0.04 ha)
Extant area: 27 700 ha
Proportion cleared: 16%
Number of samples: 54



Map 31. Distribution of samples of Hinterland Dry Grass Forest (Map Unit 31) shown by large black squares. Samples of other map units shown as small grey points.

Plate 31. Hinterland Dry Grass Forest (Map Unit 31) dominated by *Eucalyptus angophoroides, E. cypellocarpa* and *E. globoidea* with *Poa meionectes* and numerous other grass and forb species on Nungatta Road east of Nungatta Creek, Waalimma section of South East Forests National Park.

Table 31a. Diagnostic plant species of Map Unit 31.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Desmodium varians	0.704	2(1–2)	0.233	1(1–2)	positive
Eucalyptus globoidea	0.833	3(1–3)	0.22	3(1–3)	positive
Gonocarpus tetragynus	0.574	2(1–2)	0.15	2(1–2)	positive
Hydrocotyle laxiflora	0.685	2(1–2)	0.188	1(1–2)	positive
Hypericum gramineum	0.833	2(1–2)	0.219	1(1–1)	positive
Leucopogon lanceolatus var. *lanceolatus*	0.667	2(1–2)	0.396	1(1–2)	positive
Senecio diaschides	0.019	1(1–1)	0	0(0–0)	positive
Viola hederacea subsp. *hederacea*	0.519	2(2–3)	0.434	2(1–2)	positive
Lomandra longifolia	0.852	2(1–2)	0.537	2(1–2)	frequent
Poa meionectes	0.833	3(2–4)	0.528	2(1–3)	frequent
Pteridium esculentum	0.611	2(2–3)	0.576	2(1–3)	frequent
Dichelachne rara	0.667	1(1–2)	0.151	1(1–2)	frequent
Glycine clandestina	0.741	1(1–2)	0.312	1(1–2)	frequent
Gnaphalium gymnocephalum	0.63	1(1–2)	0.166	1(1–1)	frequent
Lagenifera stipitata	0.63	1.5(1–2)	0.312	1(1–2)	frequent
Lomandra multiflora	0.611	1(1–2)	0.238	1(1–2)	frequent
Microlaena stipoides var. *stipoides*	0.648	1(1–2)	0.343	2(1–2)	frequent
Senecio sp. E	0.704	1(1–2)	0.174	1(1–1)	frequent
Veronica calycina	0.778	1(1–2)	0.183	1(1–1)	frequent
Eucalyptus agglomerata	0.111	2.5(2–3)	0.109	3(2–3)	uninformative
Eucalyptus angophoroides	0.333	3(1–3)	0.033	2(1–3)	uninformative
Eucalyptus baueriana	0.019	4(4–4)	0.027	2(1–3)	uninformative
Eucalyptus bosistoana	0.111	2.5(1–3)	0.051	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.37	3(1–3)	0.312	3(2–3)	uninformative
Eucalyptus dives	0.037	2.5(2–3)	0.01	3(2–3)	uninformative
Eucalyptus elata	0.185	2.5(2–3)	0.11	3(2–3)	uninformative
Eucalyptus fastigata	0.019	3(3–3)	0.145	3(3–4)	uninformative
Eucalyptus maidenii	0.389	3(2–3)	0.051	3(2–3)	uninformative
Eucalyptus muelleriana	0.222	3(1–4)	0.139	3(3–4)	uninformative
Eucalyptus obliqua	0.019	2(2–2)	0.196	3(2–4)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.13	3(3–3)	0.017	2(2–3)	uninformative
Eucalyptus radiata	0.185	3(1–3)	0.073	3(1–3)	uninformative
Eucalyptus sieberi	0.333	3(2–4)	0.281	3(2–4)	uninformative
Eucalyptus viminalis	0.148	3(1–3)	0.054	3(1–3)	uninformative

Table 31b. Vegetation structure of Map Unit 31. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=46).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	25.1(0.9)	36(2)
Small tree	17.4	8.9(1.3)	11(2)
Shrub	95.7	2.1(0.2)	20(2)
Ground cover	100	0.5(0.0)	38(3)

Table 31c. Habitat characteristics of Map Unit 31. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		961	910–1010	54
Altitude (m)		510	396–605	54
Slope (degrees)		11	7–13	52
Terrain class				
North	38			20
Intermediate	37			19
South	17			9
Flat	8			4
Parent material				
Devonian granitoids	93			50
Low quartz sedimentaries	2			1
Ordovician high quartz sedimentaries	6			3

Map Unit 32: Coastal Foothills Dry Shrub Forest

Coastal Foothills Dry Shrub Forest has a variable tree stratum c. 25 m tall comprising *Eucalyptus longifolia* and *E. muelleriana* with *E. tricarpa, E. agglomerata, E. sieberi* and *Angophora floribunda* in various combinations. Other trees such as *Corymbia maculata* and *E. paniculata* may reach high abundance in some stands north of Bega. *Allocasuarina littoralis* may form an open subcanopy c. 12 m tall. An open shrub stratum is dominated by *Platysace lanceolata* with numerous low frequency species. The grassy groundcover is dominated by tussocks of *Chionochloa pallida* with scattered individuals of *Entolasia stricta* and *Lomandra multiflora.* Although confined to metamorphosed sediments and mudstones, Coastal Foothills Dry Shrub Forest is widespread on steep slopes and ridges at 50–250 m elevation on the coastal foothills north from Eden. About 5% of this unit has been cleared for small-scale rural development, but large areas remain on all tenures. Stands on private land are potentially threatened by further clearing with ongoing development of rural blocks. Frequent disturbance regimes that include logging (outside reserves) and fire in combination may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996) and increasing erosion from the steep slopes in these habitats. Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 31 ± 2 (0.04 ha)
Extant area: 23 614 ha
Proportion cleared: 5%
Number of samples: 42

Table 32a. Diagnostic plant species of Map Unit 32.

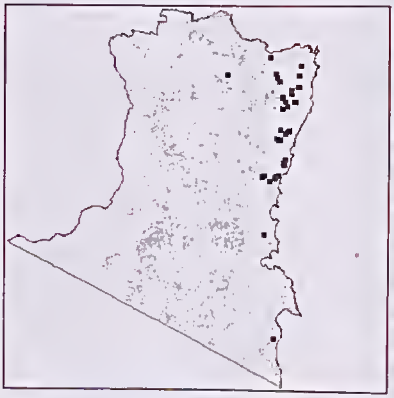
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia irrorata ssp. *irrorata*	0.024	1(1–1)	0	0(0–0)	positive
Acacia mabellae	0.024	1(1–1)	0	0(0–0)	positive
Allocasuarina littoralis	0.762	3(1–4)	0.147	2(1–3)	positive
Chionochloa pallida	0.857	3(2–4)	0.083	2(1–3)	positive
Entolasia stricta	0.571	2(1–2)	0.17	1(1–2)	positive
Eucalyptus longifolia	0.548	3(2–3)	0.015	3(2–3)	positive
Eucalyptus muelleriana	0.524	3(2–3)	0.131	3(2–4)	positive
Eucalyptus paniculata	0.024	3(3–3)	0	0(0–0)	positive
Goodenia hederacea var. *hederacea*	0.024	1(1–1)	0	0(0–0)	positive
Melaleuca hypericifolia	0.024	2(2–2)	0	0(0–0)	positive
Ozothamnus obcordatus	0.024	1(1–1)	0	0(0–0)	positive
Platysace lanceolata	0.881	2(1–3)	0.233	2(1–2)	positive
Austrostipa verticillata	0.024	1(1–1)	0	0(0–0)	positive
Xanthosia atkinsoniana	0.024	1(1–1)	0	0(0–0)	positive
Lomandra multiflora	0.762	1(1–2)	0.236	1(1–2)	frequent
Acacia subporosa	0.024	2(2–2)	0.004	1.5(1–2)	uninformative
Angophora floribunda	0.5	1(1–2)	0.083	2(1–3)	uninformative
Backhousia myrtifolia	0.024	1(1–1)	0.002	3(1–4)	uninformative
Corymbia gummifera	0.167	4(3–4)	0.016	3(2–3)	uninformative
Corymbia maculata	0.095	3.5(2–5)	0.003	3.5(2–5)	uninformative
Eucalyptus agglomerata	0.452	3(1–3)	0.099	3(2–3)	uninformative
Eucalyptus bosistoana	0.095	1.5(1–3)	0.052	2(1–3)	uninformative
Eucalyptus botryoides	0.048	1.5(1–2)	0.01	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.071	1(1–3)	0.321	3(2–3)	uninformative
Eucalyptus elata	0.048	1(1–1)	0.115	3(2–3)	uninformative
Eucalyptus globoidea	0.238	3(1–3)	0.243	3(1–3)	uninformative
Eucalyptus radiata	0.024	3(3–3)	0.078	3(1–3)	uninformative
Eucalyptus sieberi	0.333	1.5(1–3)	0.281	3(2–4)	uninformative
Eucalyptus smithii	0.095	1.5(1–3)	0.044	2(1–3)	uninformative
Eucalyptus tricarpa	0.452	2(1–3)	0.01	1.5(1–3)	uninformative
Lomandra longifolia	0.381	1(1–2)	0.554	2(1–2)	negative
Poa meionectes	0.476	2(1–2)	0.541	2(1–3)	negative
Pteridium esculentum	0.214	2(1–3)	0.587	2(1–3)	negative

Table 32b. Vegetation structure of Map Unit 32. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=35).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	25.0(0.9)	30(2)
Small tree	68.6	11.5(0.7)	18(2)
Shrub	100	2.1(0.2)	22(3)
Ground cover	100	0.5(0.0)	36(5)

Table 32c. Habitat characteristics of Map Unit 32. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		917	883–949	42
Altitude (m)		129	93–160	42
Slope (degrees)		15	8–20	41
Terrain class				
North	34			14
Intermediate	44			18
South	10			4
Flat	12			5
Parent material				
Devonian granitoids	2			1
Devonian high quartz sedimentaries	19			8
Low quartz sedimentaries	14			6
Ordovician high quartz sedimentaries	64			27



Map 32. Distribution of samples of Coastal Foothills Dry Shrub Forest (Map Unit 32) shown by large black squares. Samples of other map units shown as small grey points.

Plate 32. Coastal Foothills Dry Shrub Forest (Map Unit 32) dominated by *Eucalyptus tricarpa, E. longifolia* and *E. bosistoana* with *Acacia falciformis, Daviesia mimosoides* and *Chionochloa pallida* on Goats Knob Road, southern section of Mimosa Rocks National Park.

Map Unit 33: Coastal Range Dry Shrub Forest

Coastal Range Dry Shrub Forest is dominated by *Eucalyptus muelleriana* c. 25 m tall, occasionally with *E. cypellocarpa, E. agglomerata, E. sieberi* or *E. smithii. Acacia falciformis, Cassinia longifolia* and *Persoonia linearis* dominate a prominent stratum of shrubs 2–8 m tall, while the species-poor groundcover includes scattered individuals of *Poa meionectes, Lomandra longifolia, L. multiflora* and *Lepidosperma laterale.* Coastal Range Dry Shrub Forest is widespread on dry to intermediate slopes of the coastal and hinterland ranges south of Bega, primarily on metasediments at 100–600 m elevation. It often occupies drier slopes adjacent to gullies with Hinterland Wet Shrub Forest (Map Unit 14) or Coastal Gully Shrub Forest (Map Unit 34). Its distribution extends to higher elevations and further south than Coastal Foothills Dry Shrub Forest (Map Unit

32). No similar assemblages have been described outside the Eden region (Austin 1978, Forbes et al. 1982). Most of this assemblage occurs on public land and very little has been cleared. The principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996) and increasing erosion from the steep slopes in these habitats. Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 27 ± 1 (0.04 ha)
Extant area: 16 336 ha
Proportion cleared: 1%
Number of samples: 55

Table 33a. Diagnostic plant species of Map Unit 33.

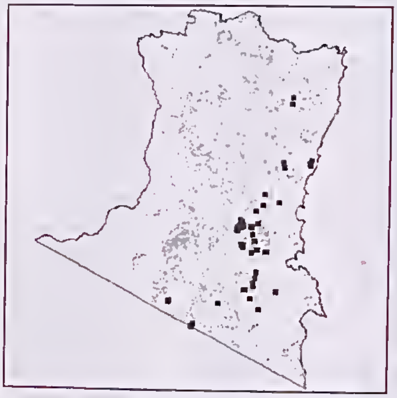
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia falciformis	0.746	2(1–3)	0.168	2(1–3)	positive
Eucalyptus muelleriana	0.855	3(3–4)	0.114	3(2–4)	positive
Pimelea humilis	0.018	2(2–2)	0	0(0–0)	positive
Zieria arborescens	0.018	1(1–1)	0	0(0–0)	positive
Lomandra longifolia	0.582	2(1–2)	0.548	2(1–2)	frequent
Poa meionectes	0.764	2(1–3)	0.53	2(1–3)	frequent
Cassinia longifolia	0.655	1(1–2)	0.17	1(1–3)	frequent
Lomandra multiflora	0.6	1(1–2)	0.238	1(1–2)	frequent
Acacia subporosa	0.018	1(1–1)	0.004	2(1–2)	uninformative
Angophora floribunda	0.018	1(1–1)	0.098	2(1–3)	uninformative
Corymbia gummifera	0.036	2(2–2)	0.02	3(2–4)	uninformative
Eucalyptus agglomerata	0.291	2.5(2–3)	0.102	3(2–3)	uninformative
Eucalyptus baueriana	0.018	3(3–3)	0.027	2(1–3)	uninformative
Eucalyptus bosistoana	0.146	2(2–3)	0.049	2(1–3)	uninformative
Eucalyptus consideniana	0.018	2(2–2)	0.021	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.327	3(2–3)	0.313	3(2–3)	uninformative
Eucalyptus elata	0.036	3.5(3–4)	0.116	3(2–3)	uninformative
Eucalyptus fastigata	0.018	3(3–3)	0.145	3(3–4)	uninformative
Eucalyptus globoidea	0.164	3(3–3)	0.246	3(1–3)	uninformative
Eucalyptus longifolia	0.073	2(1–2)	0.028	3(2–3)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.073	2(2–2)	0.011	3(2–3)	uninformative
Eucalyptus sieberi	0.436	3(1–4)	0.277	3(2–4)	uninformative
Eucalyptus smithii	0.273	3(1–3)	0.037	2(1–3)	uninformative
Eucalyptus tricarpa	0.146	1.5(1–3)	0.018	2(1–3)	uninformative
Lepidosperma laterale	0.564	1(1–2)	0.336	1(1–2)	uninformative
Persoonia linearis	0.509	1(1–2)	0.277	1(1–2)	uninformative
Pteridium esculentum	0.382	2(1–2)	0.584	2(1–3)	negative

Table 33b. Vegetation structure of Map Unit 33. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=25).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	25.6(1.2)	35(3)
Small tree	60	9.2(0.8)	24(4)
Shrub	100	1.9(0.2)	25(4)
Ground cover	100	0.5(0.1)	19(3)

Table 33c. Habitat characteristics of Map Unit 33. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		938	888–967	55
Altitude (m)		333	254–398	42
Slope (degrees)		17	10–22	39
Terrain class				
North	38			15
Intermediate	49			19
South	3			1
Flat	10			4
Parent material				
Devonian granitoids	15			8
Devonian high quartz sedimentaries	42			23
Low quartz sedimentaries	5			3
Ordovician high quartz sedimentaries	38			21



Map 33. Distribution of samples of Coastal Range Dry Shrub Forest (Map Unit 33) shown by large black squares. Samples of other map units shown as small grey points.

Plate 33. Coastal Range Dry Shrub Forest (Map Unit 33) dominated by *Eucalyptus muelleriana* and *E. sieberi* with tall shrubs of *Acacia cognata* and scattered *Goodenia ovata* and *Poa meionectes* on the footslopes of Mt Imlay, south-west of Eden. Note dead eucalypt stag with hollows on right.

Map Unit 34: Coastal Gully Shrub Forest

Coastal Gully Shrub Forest has a very variable tree stratum including *Eucalyptus bosistoana, E. cypellocarpa, E. globoidea, E. longifolia* and *E. muelleriana* in various combinations and reaching heights of up to 30 m. A open small tree stratum c. 10 m tall includes *Acacia mearnsii, Pittosporum undulatum* and several rainforest elements. The distinctive and diverse mesophyllous shrub stratum includes *Citriobatus pauciflorus, Goodenia ovata, Hibbertia aspera, Pimelea axiflora, Notelaea venosa* and *Ozothamnus diosmifolius*. The species-rich groundcover includes a variety of grasses and graminoids including *Entolasia stricta, Microlaena stipoides, Oplismenus imbecillus, Poa meionectes, Lomandra longifolia* and *Lepidosperma laterale*, and forbs *Desmodium varians, Dichondra repens* and *Pratia purpurascens*. A diverse compliment of vines entangles the shrub and ground strata including *Glycine clandestina, Marsdenia rostrata,* *Eustrephus latifolius, Geitonoplesium cymosum* and *Pandorea pandorana*. Coastal Gully Shrub Forest occurs in steep gullies on the coastal range mainly north of Merimbula, often co-occurring with Coastal Foothills Dry Shrub Forest (Map Unit 32), which occupies adjacent upper slopes. It is restricted to metasediments below 200 m elevation. Similar assemblages are likely to extend further north where rugged sedimentary terrain is close to the coast (Austin 1978). Substantial areas of this assemblage remain on all tenures, slightly more than 13% being cleared. About 5000 ha is potentially threatened by development of small rural holdings on private land. Frequent disturbance regimes that include logging (outside reserves) and fire in combination may reduce diversity by interrupting life-cycle processes of woody species and increasing erosion on the steep slopes in these habitats. Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if high levels of diversity are to be maintained in this species-rich assemblage.

Species richness: 46 ± 3 (0.04 ha)
Extant area: 15 289 ha
Proportion cleared: 13%
Number of samples: 24

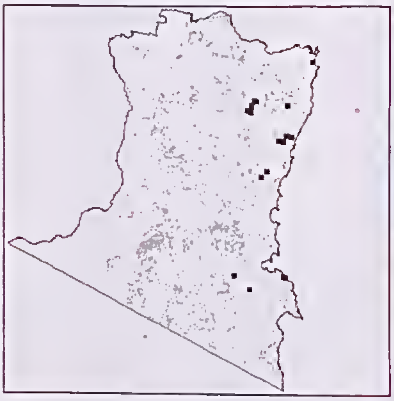
Table 34a. Diagnostic plant species of Map Unit 34.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia mearnsii	0.667	2(1–3)	0.155	2(1–3)	positive
Citriobatus pauciflorus	0.125	1(1–2)	0	0(0–0)	positive
Desmodium varians	0.667	2(1–2)	0.243	1(1–2)	positive
Dichondra repens	0.833	2(1–2)	0.275	2(1–2)	positive
Doodia caudata var. caudata	0.042	1(1–1)	0	0(0–0)	positive
Entolasia stricta	0.667	2(2–3)	0.173	1(1–2)	positive
Glycine clandestina	0.792	2(1–2)	0.32	1(1–2)	positive
Goodenia ovata	0.75	2(1–2)	0.164	2(1–2)	positive
Hibbertia aspera	0.542	2(2–2)	0.06	2(1–2)	positive
Marsdenia rostrata	0.625	2(1–2)	0.077	2(1–2)	positive
Microlaena stipoides var. stipoides	0.708	2(1–2)	0.348	1.5(1–2)	positive
Muellerina celastroides	0.042	1(1–1)	0	0(0–0)	positive
Oplismenus imbecillis	0.833	2(1–2)	0.097	2(1–2)	positive
Pimelea axiflora	0.5	2(2–3)	0.113	1(1–2)	positive
Pittosporum undulatum	0.625	2(1–3)	0.083	1(1–2)	positive
Sarcochilus hillii	0.042	1(1–1)	0	0(0–0)	positive
Zieria cytisoides	0.042	2(2–2)	0	0(0–0)	positive
Zieria littoralis	0.042	1(1–1)	0	0(0–0)	positive
Poa meionectes	0.75	2(1–3)	0.535	2(1–3)	frequent
Eustrephus latifolius	0.917	1(1–1)	0.162	1(1–1)	frequent
Gahnia melanocarpa	0.625	1(1–2)	0.066	1(1–2)	frequent
Geitonoplesium cymosum	0.75	1(1–2)	0.099	1(1–2)	frequent
Lepidosperma laterale	0.667	1(1–2)	0.339	1(1–2)	frequent
Lomandra longifolia	0.833	1(1–1)	0.544	2(1–2)	frequent
Notelaea venosa	0.75	1(1–2)	0.103	1(1–2)	frequent
Ozothamnus diosmifolius	0.625	1(1–3)	0.07	1(1–2)	frequent
Pandorea pandorana	0.625	1(1–2)	0.113	1(1–1)	frequent
Pratia purpurascens	0.667	1(1–2)	0.094	1(1–2)	frequent
Acacia silvestris	0.083	2.5(1–4)	0.002	5(4–5)	uninformative

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acmena smithii	0.042	1(1–1)	0.032	3(1–4)	uninformative
Alectryon subcinereus	0.083	1(1–1)	0.006	1(1–3)	uninformative
Angophora floribunda	0.292	3(1–3)	0.092	2(1–3)	uninformative
Backhousia myrtifolia	0.042	4(4–4)	0.002	1(1–3)	uninformative
Eucalyptus baueriana	0.083	3(2–4)	0.026	2(1–3)	uninformative
Eucalyptus bosistoana	0.333	2(1–3)	0.048	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.375	3(1–4)	0.313	3(2–3)	uninformative
Eucalyptus elata	0.25	2.5(2–3)	0.111	3(2–3)	uninformative
Eucalyptus globoidea	0.333	3(1–3)	0.241	3(1–3)	uninformative
Eucalyptus longifolia	0.417	2.5(1–3)	0.023	3(2–3)	uninformative
Eucalyptus muelleriana	0.375	3(1–3)	0.138	3(3–4)	uninformative
Eucalyptus pilularis	0.042	1(1–1)	0.003	3.5(2–4)	uninformative
Eucalyptus smithii	0.042	1(1–1)	0.046	2(1–3)	uninformative
Eucalyptus tricarpa	0.042	1(1–1)	0.022	2(1–3)	uninformative
Pteridium esculentum	0.417	2(1–4)	0.579	2(1–3)	negative

Table 34b. Vegetation structure of Map Unit 34. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=22).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	28.0(1.5)	36(2)
Small tree	86.4	10.3(1.0)	25(4)
Shrub	100	2.8(0.5)	25(3)
Ground cover	100	0.6(0.1)	40(6)



Map 34. Distribution of samples of Coastal Gully Shrub Forest (Map Unit 34) shown by large black squares. Samples of other map units shown as small grey points.

Plate 34. Coastal Range Dry Shrub Forest (Map Unit 34) variant dominated by *Eucalyptus paniculata*, *Corymbia maculata* and *Macozamia communis* with a diverse grassy groundcover, west of Bermagui in Bermagui State Forest.

Table 34c. Habitat characteristics of Map Unit 34. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		911	881–938	24
Altitude (m)		95	40–165	24

Slope (degrees)		16	10–23	24
Terrain class				
North	17			4
Intermediate	38			9
South	38			9
Flat	8			2
Parent material				
Devonian high quartz sedimentaries	4			1
Low quartz sedimentaries	8			2
Ordovician high quartz sedimentaries	88			21

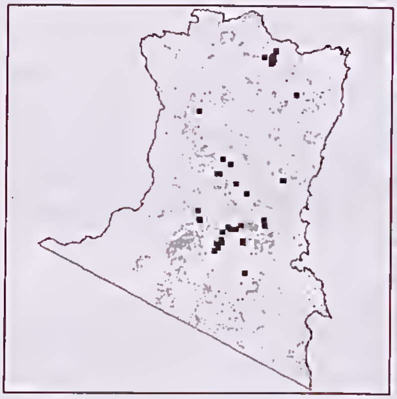
Map Unit 35: Escarpment Dry Grass Forest

Escarpment Dry Grass Forest is dominated by *Eucalyptus maidenii* and *E. globoidea,* occasionally with *E. bosistoana* over 25 m tall. *Indigofera australis* and *Senecio linearifolius* dominate an open stratum of mesophyllous shrubs with less frequent species including *Cassinia* spp. and *Ozothamnus diosmifolius,* while the diverse grassy groundcover is dominated by *Poa meionectes, Microlaena stipoides* and *Lomandra longifolia,* forbs *Plectranthus parviflorus, Desmodium varians* and *Dichondra repens,* and the twiner *Glycine clandestina.* Escarpment Dry Grass Forest occurs at 150–700 m elevation on steep to moderate, dry granitoid slopes surrounding the Bega and Towamba valleys. Unusual stands occur on small basalt outcrops west of Nethercote. In the Murrabrine area and on the Bega valley escarpment, it is interspersed with Hinterland Wet Fern Forest (Map Unit 13), which occupies more sheltered mesic sites. South of Wyndham, it occurs in hilly terrain interspersed with Bega Wet Shrub Forest (Map Unit 19) on low relief sites. While this unit may extend a short distance further north in the Yowrie district, no similar assemblages have been described outside the Eden region (Austin 1978, Forbes et al. 1982). Approximately one-third of Escarpment Dry Grass Forest has been cleared for agriculture and over half of the remainder occurs on private land (mainly on toeslopes and foothills of the escarpment) where it is potentially threatened by further clearing. Soil erosion is a potential threat associated with logging, although in some cases this will be restricted to indirect effects from operations upslope because steep slopes may preclude direct timber harvesting within stands of this assemblage. Frequent burning around the interface of private and public land may also be a threat to some stands of Escarpment Dry Grass Forest. This may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996) and increasing erosion from the steep slopes in these habitats. Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 37 ± 1 (0.04 ha)
Extant area: 24 423 ha
Proportion cleared: 37%
Number of samples: 51

Table 35a. Diagnostic plant species of Map Unit 35.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Chenopodium carinatum	0.039	1(1–1)	0	0(0–0)	positive
Desmodium varians	0.863	2(2–2)	0.228	1(1–2)	positive
Dichondra repens	0.784	2(1–2)	0.266	1.5(1–2)	positive
Eucalyptus globoidea	0.588	3(2–3)	0.23	3(1–3)	positive
Eucalyptus maidenii	0.824	3(3–4)	0.036	3(2–3)	positive
Indigofera australis	0.608	2(2–3)	0.089	1(1–2)	positive
Plectranthus parviflorus	0.588	2(1–2)	0.039	1(1–2)	positive
Senecio linearifolius	0.608	2(1–3)	0.227	1(1–2)	positive
Austrostipa scabra	0.02	1(1–1)	0	0(0–0)	positive
Poa meionectes	0.667	3(2–3)	0.534	2(1–3)	frequent
Glycine clandestina	0.863	1(1–2)	0.308	1(1–2)	frequent
Lomandra longifolia	0.706	1(1–2)	0.543	2(1–2)	frequent
Microlaena stipoides var. *stipoides*	0.686	1(1–2)	0.342	2(1–2)	frequent
Acmena smithii	0.02	1(1–1)	0.032	3(1–4)	uninformative
Alectryon subcinereus	0.02	1(1–1)	0.007	1(1–2)	uninformative
Brachychiton populneus subsp. *populneus*	0.137	1(1–1)	0.019	1(1–1)	uninformative
Eucalyptus agglomerata	0.02	3(3–3)	0.112	3(2–3)	uninformative
Eucalyptus angophoroides	0.039	2(1–3)	0.044	2(1–3)	uninformative
Eucalyptus baueriana	0.216	2(2–3)	0.02	2.5(1–4)	uninformative
Eucalyptus bosistoana	0.392	3(2–3)	0.041	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.137	1(1–2)	0.32	3(2–3)	uninformative
Eucalyptus elata	0.255	3(2–3)	0.108	3(1–3)	uninformative
Eucalyptus fastigata	0.118	2(2–3)	0.141	3(3–4)	uninformative
Eucalyptus muelleriana	0.294	3(2–3)	0.137	3(2–4)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.137	1(1–2)	0.01	2(2–3)	uninformative
Eucalyptus sieberi	0.078	2.5(2–4)	0.29	3(2–4)	uninformative
Eucalyptus smithii	0.118	2(2–3)	0.043	2(1–3)	uninformative
Eucalyptus tereticornis	0.02	3(3–3)	0.048	3(1–3)	uninformative
Eucalyptus tricarpa	0.02	1(1–1)	0.023	2(1–3)	uninformative
Pteridium esculentum	0.314	1.5(1–2)	0.586	2(1–3)	negative



Map 35. Distribution of samples of Escarpment Dry Grass Forest (Map Unit 35) shown by large black squares. Samples of other map units shown as small grey points.

Plate 35. Coastal Range Dry Shrub Forest (Map Unit 35) dominated by *Eucalyptus maidenii* and *E. bosistoana* saplings with *Indigofera australis*, *Acacia falciformis* and *Poa meionectes* on the dry lower slopes of the Brown Mountain escarpment, Tantawangalo section of South East Forests National Park.

Table 35b. Vegetation structure of Map Unit 35. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=24).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	27.4(1.3)	31(2)
Small tree	50	8.8(0.9)	21(3)
Shrub	100	2.0(0.2)	21(3)
Ground cover	100	0.4(0.0)	30(6)

Table 35c. Habitat characteristics of Map Unit 35. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5°and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		938	873–1010	51
Altitude (m)		400	320–485	51
Slope (degrees)		15	10–20	36
Terrain class				
North	33			12
Intermediate	47			17
South	8			3
Flat	11			4
Parent material				
Devonian Basalt	4			2
Devonian granitoids	75			38
Low quartz sedimentaries	2			1
Ordovician high quartz sedimentaries	20			10

Map Unit 36: Dune Dry Shrub Forest

Dune Dry Shrub Forest is dominated by *Eucalyptus botryoides* c. 10 m tall. A prominent stratum of small trees and large shrubs includes *Banksia integrifolia, B. serrata* and *Monotoca elliptica.* Smaller shrubs include *Astroloma pinifolium, Macrozamia communis, Acacia sophorae, Correa reflexa* and *Hibbertia obtusifolia.* The groundcover includes grasses and graminoids *Lomandra longifolia, Poa meionectes, Themeda australis* and *Imperata cylindrica,* forbs *Dichondra repens* and *Pratia purpurascens,* and bracken *Pteridium esculentum.* Dune Dry Shrub Forest is restricted to sheltered slopes and flats on well-drained calcareous sand dunes and adjacent metasediments within a few hundred metres of the coast north from Merimbula. A similar assemblage is scattered along the coast of East Gippsland (Community 19.1, Forbes et al. 1982). Similar vegetation is also likely to be found in near-coastal habitats north of the Eden region. Two-thirds of this restricted unit has been cleared for coastal development and almost half of the remaining 600 ha occurs on private land or special crown tenures threatened by further clearing. Because of their close proximity to urban settlement and/or high levels of recreational usage, remnants of Dune Dry Shrub Forest are exposed to continuing degradation associated with rubbish dumping, frequent burning, erosion, nutrification and weed invasion. These threats apply throughout the range of this vegetation, although impacts are mitigated by management to varying degrees in reserved stands.

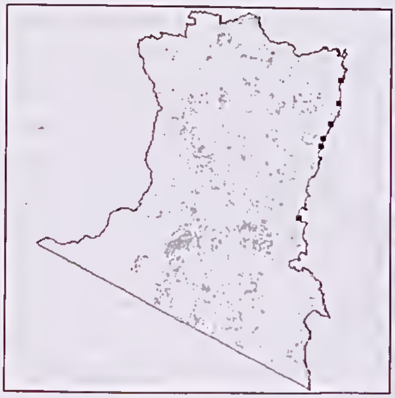
Species richness: 22 ± 2 (0.04 ha)
Extant area: 646 ha
Proportion cleared: 39%
Number of samples: 6

Table 36a. Diagnostic plant species of Map Unit 36.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Astroloma pinifolium	0.167	1(1–1)	0	0(0–0)	positive
Banksia serrata	0.5	2(1–3)	0.04	1(1–2)	positive
Banksia integrifolia	1	1(1–2)	0.031	1(1–2)	frequent
Dichondra repens	0.667	1(1–1)	0.282	2(1–2)	frequent
Eucalyptus botryoides	0.667	1.5(1–4)	0.009	2(1–3)	frequent
Lomandra longifolia	0.667	1(1–1)	0.548	2(1–2)	frequent
Macrozamia communis	0.667	1.5(1–3)	0.011	1.5(1–2)	frequent
Monotoca elliptica	1	1(1–1)	0.017	1(1–1)	frequent
Poa meionectes	0.667	1(1–1)	0.538	2(1–3)	frequent
Pratia purpurascens	0.667	1(1–1)	0.101	1(1–2)	frequent
Pteridium esculentum	1	1(1–3)	0.575	2(1–3)	frequent
Themeda australis	0.667	1.5(1–2)	0.112	2(1–3)	frequent
Acacia sophorae	0.5	1(1–1)	0.033	1(1–2)	uninformative
Correa reflexa	0.5	1(1–1)	0.126	1(1–2)	uninformative
Corymbia maculata	0.167	2(2–2)	0.005	4(3–5)	uninformative
Eucalyptus tereticornis	0.167	2(2–2)	0.046	3(1–3)	uninformative
Hibbertia obtusifolia	0.5	1(1–1)	0.085	1(1–2)	uninformative
Imperata cylindrica var. major	0.5	1(1–1)	0.051	1(1–2)	uninformative

Table 36b. Vegetation structure of Map Unit 36. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=1).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	10.0(-)	45(-)
Small tree	0	-(-)	-(-)
Shrub	100	1.0(-)	15(-)
Ground cover	100	0.5(-)	90(-)



Map 36. Distribution of samples of Dune Dry Shrub Forest (Map Unit 36) shown by large black squares. Samples of other map units shown as small grey points.

Plate 36. Dune Dry Shrub Forest (Map Unit 36) dominated by *Eucalyptus botryoides with Banksia serrata, B. integrifolia* and *Pteridium esculentum* behind Baragoot Beach, south of Bermagui.

Table 36c. Habitat characteristics of Map Unit 36. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		724	851–876	6
Altitude (m)		8	5–5	6
Slope (degrees)		2	2–2	1
Terrain class				
North	0			0
Intermediate	0			0
South	0			0
Flat	100			1
Parent material				
Holocene Coastal Sands	100			6

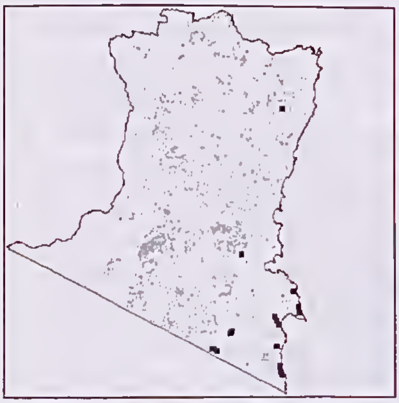
Map Unit 37: Lowland Gully Shrub Forest

Lowland Gully Shrub Forest is dominated by *Angophora floribunda* up to 25 m in height with *Eucalyptus cypellocarpa,* and occasionally *E. baxteri* and *E. globoidea.* One or two prominent tall shrub strata 5–8 m tall are dominated by *Acacia longifolia* and *Allocasuarina littoralis,* with smaller shrubs including *Goodenia ovata* and *Hibbertia aspera.* The tall semi-continuous groundcover is dominated by bracken *Pteridium esculentum* and grasses and graminoids *Lomandra longifolia, Entolasia stricta* and *Poa meionectes,* with other herbs including *Dianella caerulea, Gonocarpus teucrioides, Viola hederacea* and the twiner *Glycine clandestina.* Lowland Gully Shrub Forest occurs on gully flats either on Tertiary alluvium, Holocene sands or on deep colluvial sandy soils washed down from adjacent sedimentary substrates upslope. It is most common in the Nadgee-Timbillica area below 100 m elevation and includes the well-known Monkey Gum flats in that area. These flats provide important resource-rich fauna habitat with dense groundcover in an area largely covered by open dry sclerophyllous forests. Lowland Gully Shrub Forest has affinities with a highly restricted assemblage in similar habitats in far East Gippsland (Ecological Vegetation Class 4, Woodgate et al. 1994), but this unit has *E. botryoides* as a co-dominant tree and a greater diversity of vines. Similar vegetation is unlikely to occur north of the Eden region. Relatively little of this vegetation has been cleared. Although some stands on private land are potentially threatened by clearing, the principal threat is frequent disturbance regimes. In some unprotected sites with *E. cypellocarpa* the disturbance regime may include logging, although *A. floribunda* is not an economic wood species and some flats in production forest are protected by management prescriptions. Sedimentation may affect stands where logging occurs upslope. Where logging is carried out and followed by regeneration burns and thinning, this may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Frequent burning may reduce diversity by interrupting life-cycle processes of woody species and by competitive exclusion due to increased densities of *P. esculentum* and *I. cylindrica* (Keith 1996). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks, decline in densities of rhizomatous species and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 35± 2 (0.04 ha)
Extant area: 14 685 ha
Proportion cleared: 5%
Number of samples: 17

Table 37a. Diagnostic plant species of Map Unit 37.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia longifolia	0.647	3(2–3)	0.135	2(1–3)	positive
Allocasuarina littoralis	0.529	2(1–3)	0.16	2(1–3)	positive
Angophora floribunda	0.824	3(3–4)	0.087	2(1–3)	positive
Dianella caerulea	0.706	2(1–2)	0.274	1(1–2)	positive
Entolasia stricta	0.588	2(2–3)	0.177	1(1–2)	positive
Eucalyptus pseudoglobulus	0.059	3(3–3)	0	0(0–0)	positive
Gonocarpus teucrioides	0.529	2(1–3)	0.313	2(1–2)	positive
Goodenia ovata	0.706	3(2–4)	0.167	2(1–2)	positive
Hibbertia aspera	0.529	2(2–3)	0.063	2(1–2)	positive
Viola hederacea subsp. *hederacea*	0.706	2(1–2)	0.434	2(1–2)	positive
Lomandra longifolia	0.824	3(2–4)	0.546	2(1–2)	frequent
Poa meionectes	0.882	2(2–3)	0.535	2(1–3)	frequent
Pteridium esculentum	0.882	3(2–4)	0.573	2(1–3)	frequent
Glycine clandestina	0.706	1(1–2)	0.323	1(1–2)	frequent
Corymbia gummifera	0.059	3(3–3)	0.02	3(2–4)	uninformative
Eucalyptus angophoroides	0.059	4(4–4)	0.044	2(1–3)	uninformative
Eucalyptus baxteri	0.294	3(2–4)	0.005	3(2–3)	uninformative
Eucalyptus cypellocarpa	0.412	1(1–4)	0.313	3(2–3)	uninformative
Eucalyptus elata	0.059	1(1–1)	0.113	3(2–3)	uninformative
Eucalyptus globoidea	0.235	2.5(1–4)	0.243	3(1–3)	uninformative
Eucalyptus longifolia	0.177	3(3–3)	0.028	3(2–3)	uninformative
Eucalyptus muelleriana	0.118	3.5(3–4)	0.142	3(2–4)	uninformative
Eucalyptus obliqua	0.118	2.5(1–4)	0.19	3(2–4)	uninformative
Eucalyptus ovata	0.177	3(3–3)	0.021	2(1–3)	uninformative
Eucalyptus sieberi	0.118	3(2–4)	0.285	3(2–4)	uninformative
Eucalyptus smithii	0.059	1(1–1)	0.045	2(1–3)	uninformative



Map 37. Distribution of samples of Lowland Gully Shrub Forest (Map Unit 37) shown by large black squares. Samples of other map units shown as small grey points.

Plate 37. Lowland Gully Shrub Forest (Map Unit 37) dominated by *Angophora floribunda* with *Eucalyptus cypellocarpa, Acacia longifolia, A. mearnsii, Pteridium esculentum* and *Microlaena stipoides* at Saltwater Creek flat, Ben Boyd National Park.

Table 37b. Vegetation structure of Map Unit 37. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=15).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	23.3(2.2)	42(3)
Small tree	33.3	7.8(0.7)	37(9)
Shrub	100	5.0(2.2)	40(7)
Ground cover	100	1.1(0.2)	65(7)

Table 37c. Habitat characteristics of Map Unit 37. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		899	881–917	17
Altitude (m)		71	15–120	17
Slope (degrees)		5	2–6	16
Terrain class				
North	6			1
Intermediate	13			2
South	25			4
Flat	56			9
Parent material				
Devonian high quartz sedimentaries	6			1
Holocene Coastal Sands	18			3
Low quartz sedimentaries	6			1
Ordovician high quartz sedimentaries	24			4
Tertiary Alluvium	47			8

Map Unit 38: Southern Riparian Scrub

Southern Riparian Scrub has a patchy shrub stratum 2 m tall, dominated by *Tristaniopsis laurina, Acacia floribunda, Baeckea virgata, Calytrix tetragona, Kunzea ericoides, Leptospermum lanigerum* and *L. scoparium,* occasionally with emergent saplings of *Eucalyptus elata* c. 8 m tall. The patchy groundcover is dominated by rushes and sedges *Lomandra longifolia* and *Gahnia sieberiana,* with small ferns, *Adiantum aethiopicum.* Southern Riparian Scrub is restricted to riverine alluvium derived from granitoid or sedimentary parent materials at elevations up to 400 m along major streams in the south, including the Genoa, Wallagaraugh and Merrica Rivers, and possibly parts of the Towamba River. Although not explicitly described, similar vegetation may occur in East Gippsland within the riparian scrub complex (Ecological Vegetation Class 17, Woodgate et al. 1994), which also includes assemblages related to Lowland Swamp (Map Unit 57) and Swamp Forest (Map Unit 58). The principal threat to Southern Riparian Scrub is from sedimentation and weed invasion associated with roading and logging activities in stream catchments. Mitigation measures include stream buffer strips of varying width and erosion control during earthworks and logging. Frequent fire regimes may reduce diversity by interrupting life-cycle processes of woody species if streams are used repeatedly as ignition lines for hazard reduction.

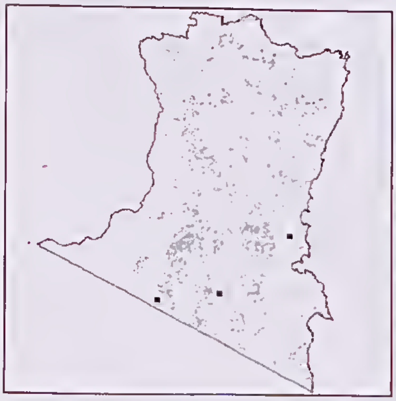
Species richness: 22 ± 14 (0.04 ha)
Extant area: 441 ha
Proportion cleared: 10%
Number of samples: 3

Table 38a. Diagnostic plant species of Map Unit 38.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia floribunda	0.667	2.5(2–3)	0.016	2(1–3)	positive
Baeckea virgata	0.667	2(1–3)	0.029	2(1–2)	positive
Calytrix tetragona	0.667	2(1–3)	0.004	2.5(2–3)	positive
Grevillea linearifolia form 'g'	0.333	3(3–3)	0	0(0–0)	positive
Kunzea ericoides	0.667	2(2–2)	0.043	2(1–3)	positive
Leptospermum lanigerum	0.667	3(3–3)	0.007	2(1–3)	positive
Leptospermum scoparium	0.667	2(1–3)	0.016	2(1–3)	positive
Tristaniopsis laurina	1	4(3–5)	0.001	1.5(1–2)	positive
Utricularia lateriflora	0.333	1(1–1)	0	0(0–0)	positive
Vallisneria gigantea	0.333	1(1–1)	0	0(0–0)	positive
Lomandra longifolia	0.667	3.5(3–4)	0.549	2(1–2)	frequent
Adiantum aethiopicum	0.667	1(1–1)	0.076	1(1–2)	frequent
Gahnia sieberiana	0.667	1(1–1)	0.076	1(1–2)	frequent
Eucalyptus elata	0.333	1(1–1)	0.112	3(2–3)	uninformative
Poa meionectes	0	0(2–0)	0.54	2(1–3)	negative
Pteridium esculentum	0.333	1(1–1)	0.577	2(1–3)	negative

Table 38b. Vegetation structure of Map Unit 38. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=3).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	0	-(-)	-(-)
Small tree	66.7	8.5(3.5)	25(15)
Shrub	100	2.0(0.3)	37(18)
Ground cover	100	0.5(0.0)	18(7)



Map 38. Distribution of samples of Southern Riparian Scrub (Map Unit 38) shown by large black squares. Samples of other map units shown as small grey points.

Plate 38. Southern Riparian Scrub (Map Unit 38) with *Callistemon subulatus*, *Acacia floribunda*, *Calytrix tetragona* and *Lomandra longifolia* among granitoid outcrops in the bed of Imlay Creek near Imlay Road crossing, Wallagaraugh Flora Reserve.

Table 38c. Habitat characteristics of Map Unit 38. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		921	904–949	3
Altitude (m)		235	168–348	3
Slope (degrees)		0	0–0	3
Terrain class				
North	0			0
Intermediate	0			0
South	0			0
Flat	100			3
Parent material				
Devonian granitoids	67			2
Tertiary Alluvium	33			1

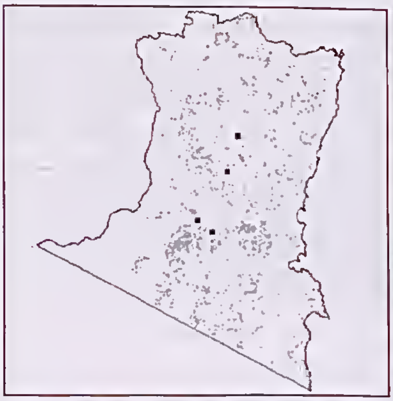
Map Unit 39: Northern Riparian Scrub

Northern Riparian Scrub has a patchy shrub stratum up to 4 m tall, dominated by *Acacia floribunda* and *Leptospermum emarginatum* with *Kunzea ericoides, Lomatia myricoides, Acacia mearnsii, Bursaria spinosa, Correa reflexa* and *Exocarpos cupressiformis.* Scattered emergent trees include *Eucalyptus elata* and other eucalypts up to 15 m tall from adjacent forest vegetation. The patchy groundcover is dominated by grasses and graminoids *Lomandra longifolia, Entolasia stricta, Themeda australis* and *Microlaena stipoides,* with small scattered herbs including *Dianella revoluta, Opercularia aspera* and *Persicaria decipiens.* Northern Riparian Scrub is restricted to riverine alluvium derived from granitoid substrates at elevations up to 250 m along major streams in the north, including the lower Bemboka River and lower reaches of Tantawangalo, Stockyard and Myanba Creeks. It occurs in lower rainfall districts (< 850 mm annual precipitation) than Southern Riparian Scrub (Map Unit 38) and has a different shrub composition. No similar assemblages have been described in adjacent regions (Austin 1978, Woodgate et al. 1994). Over one-third of Northern Riparian Scrub has been cleared in agricultural districts and almost all of the remainder is threatened by further clearing and degradation on private land. The principal threats associated with agricultural land uses include sedimentation, nutrification, weed invasion and physical damage by stock. Some sedimentation may originate from roadworks and logging in steeper, higher rainfall areas in the upper catchments. Frequent burning of adjacent vegetation may also threaten shrub diversity at some sites.

Species richness: 37 ± 7 (0.04 ha)
Extant area: 447 ha
Proportion cleared: 35%
Number of samples: 5

Table 39a. Diagnostic plant species of Map Unit 39.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia floribunda	1	3(2–3)	0.014	2(1–3)	positive
Entolasia stricta	0.6	2(1–2)	0.18	1(1–2)	positive
Kunzea ericoides	0.6	2(2–3)	0.042	2(1–3)	positive
Leptospermum emarginatum	1	2(2–3)	0.003	3(2–3)	positive
Leptospermum polygalifolium subsp. *polygalifolium*	0.2	3(3–3)	0	0(0–0)	positive
Lomatia myricoides	0.6	2(2–2)	0.074	1(1–2)	positive
Themeda australis	0.6	2(1–2)	0.113	2(1–3)	positive
Lomandra longifolia	1	2(3–3)	0.547	2(1–2)	frequent
Acacia mearnsii	1	1(1–2)	0.16	2(1–3)	frequent
Bursaria spinosa	0.6	1(2–3)	0.121	1(1–2)	frequent
Correa reflexa	0.6	1(1–2)	0.125	1(1–2)	frequent
Dianella revoluta var. *revoluta*	0.6	1(1–1)	0.08	1(1–1)	frequent
Exocarpos cupressiformis	0.6	1(1–2)	0.047	1(1–2)	frequent
Microlaena stipoides var. *stipoides*	0.8	1(1–2)	0.352	2(1–2)	frequent
Opercularia aspera	0.6	1(1–2)	0.138	1(1–1)	frequent
Persicaria decipiens	0.6	1(1–1)	0.003	1(1–2)	frequent
Eucalyptus elata	0.4	1.5(1–2)	0.112	3(2–3)	uninformative
Eucalyptus maidenii	0.4	3(2–4)	0.062	3(2–3)	uninformative
Eucalyptus muelleriana	0.2	2(2–2)	0.142	3(2–4)	uninformative
Eucalyptus polyanthemos subsp. *vestita*	0.2	2(2–2)	0.012	2.5(2–3)	uninformative
Eucalyptus tereticornis	0.2	3(3–3)	0.046	3(1–3)	uninformative
Poa meionectes	0.2	2(2–2)	0.54	2(1–3)	negative
Pteridium esculentum	0.2	1(1–1)	0.578	2(1–3)	negative



Map 39. Distribution of samples of Northern Riparian Scrub (Map Unit 39) shown by large black squares. Samples of other map units shown as small grey points.

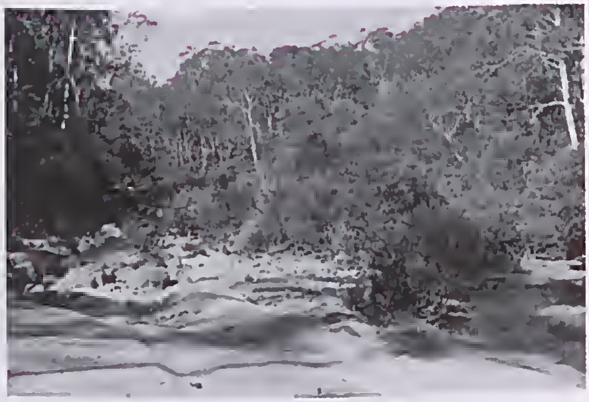


Plate 39. Northern Riparian Scrub (Map Unit 39) with *Acacia floribunda* and *Leptospermum emarginatum* in the sandy bed of Myrtle Creek, Yowaka section of South East Forests National Park.

Table 39b. Vegetation structure of Map Unit 39. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=5).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	0	-(-)	-(-)
Small tree	60	13.0(3.1)	15(10)
Shrub	100	3.6(0.7)	43(11)
Ground cover	100	0.4(0.1)	19(9)

Table 39c. Habitat characteristics of Map Unit 39. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		803	796–815	5
Altitude (m)		171	95–250	5
Slope (degrees)		4	0–5	5
Terrain class				
North	20			1
Intermediate	0			0
South	20			1
Flat	60			3
Parent material				
Devonian granitoids	100			5

Map Unit 40: Riverine Forest

Riverine Forest is dominated by *Casuarina cunninghamiana* up to 30 m tall with a tall shrub stratum (c. 8 m) including *Acacia floribunda, A. mearnsii* and *Hymenanthera dentata*. The dense but patchy groundcover is dominated by grasses and graminoids including *Entolasia marginata, Microlaena stipoides, Oplismenus aemulus* and *Lomandra longifolia,* with herbs such as *Geranium solanderi* and *Sigesbeckia orientalis.* Riverine Forest is restricted to riverine alluvium derived from granitoid or sedimentary parent materials below 20 m elevation along the lower Brogo River on the Bega floodplain. More than one-fifth of its original extent has been lost to clearing, although this is a conservative estimate, as it may have extended up the Bega River prior to settlement. The remaining 200 ha occur on private land and are threatened by clearing and degradation associated with agricultural land uses including sedimentation, nutrification, weed invasion and physical damage by stock. Limited stands near Bega that are open to public access are also susceptible to trampling, rubbish dumping and uncontrolled fires. Related and similarly depleted assemblages may occur on floodplains further north (e.g. on the lower Tuross and Moruya Rivers), but none occur to the south, since *C. cunninghamiana* reaches its southern limit at Bega (Keith 1990).

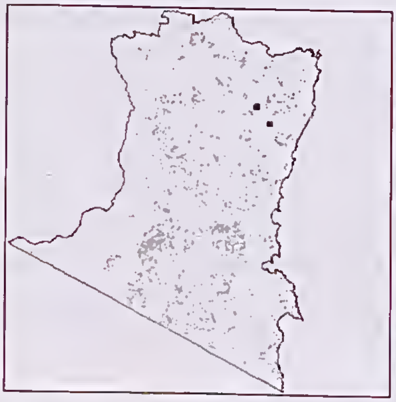
Species richness: 27 ± 9 (0.04 ha)
Extant area: 197 ha
Proportion cleared: 21% (probably an underestimate)
Number of samples: 4

Table 40a. Diagnostic plant species of Map Unit 40.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia floribunda	1	2.5(1–3)	0.015	2(1–3)	positive
Acacia mearnsii	1	3(2–3)	0.161	2(1–3)	positive
Aneilema biflorum	0.25	1(1–1)	0	0(0–0)	positive
Casuarina cunninghamiana	1	4(3–4)	0	0(0–0)	positive
Cyperus imbecillis	0.25	1(1–1)	0	0(0–0)	positive
Microlaena stipoides var. *stipoides*	1	2.5(2–3)	0.352	1(1–2)	positive
Omalanthus stillingiifolius	0.25	1(1–1)	0	0(0–0)	positive
Entolasia marginata	1	1(1–1)	0.044	1(1–2)	frequent
Geranium solanderi	0.75	1(1–1)	0.091	1(1–2)	frequent
Hymenanthera dentata	1	1.5(1–3)	0.067	1(1–2)	frequent
Oplimensus aemulus var. *aemulus*	1	1.5(1–2)	0.007	2(1–2)	frequent
Sigesbeckia orientalis	0.75	1(1–1)	0.076	1(1–2)	frequent
Lomandra longifolia	1	1(1–2)	0.548	2(1–2)	frequent
Poa meionectes	0	0(1–0)	0.54	2(1–3)	negative
Pteridium esculentum	0.25	1(1–1)	0.578	2(1–3)	negative

Table 40b. Vegetation structure of Map Unit 40. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=4).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	28.0(1.8)	26(6)
Small tree	100	8.0(1.4)	11(3)
Shrub	75	2.7(0.3)	21(10)
Ground cover	100	0.3(0.1)	52(20)



Map 40. Distribution of samples of Riverine Forest (Map Unit 40) shown by large black squares. Samples of other map units shown as small grey points.

Plate 40. Riverine Forest (Map Unit 40) dominated by *Casuarina cunninghamiana* with *Acacia mearnsii* and scattered *Lomandra longifolia* on the lower Brogo River downstream from Brogo Pass.

Table 40c. Habitat characteristics of Map Unit 40. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		875	862–887	4
Altitude (m)		26	15–36	4
Slope (degrees)		3	1–5	4
Terrain class				
North	0			0
Intermediate	25			1
South	25			1
Flat	50			2
Parent material				
Devonian granitoids	100			4

Map Unit 41: Mountain Intermediate Shrub Forest

Mountain Intermediate Shrub Forest is a tall forest dominated by *Eucalyptus fraxinoides* with *E. sieberi,* averaging 25 m in height. Its open shrub stratum includes *Leucopogon lanceolatus, Persoonia silvatica* and *Platysace lanceolata* with smaller shrubs including *Goodenia ovata* and *Hibbertia aspera.* The groundcover comprises scattered clumps of grasses, graminoids and lilioids *Hierochloe rariflora, Lomandra longifolia, Dianella tasmanica* and *Poa meionectes,* and bracken *Pteridium esculentum.* Mountain Intermediate Shrub Forest typically occupies steep, sheltered upper slopes either on metasediments or granitoid substrates. Usually it is found above 700 m elevation on the tableland range and outlying mountains (Burragate Peak, Mt Imlay and Letts Mountain), although unusual stands occur below 400 m on the Howe Range near the Victorian border. These latter stands extend across the border a short distance, but otherwise no similar assemblage has been described in East Gippsland (Woodgate et al. 1994). North from Brown Mountain, Mountain Intermediate Shrub Forest grades into Wadbilliga Range Shrub Forest (Map Unit W2). Mountain Intermediate Shrub Forest remains uncleared due to its occurrence in rugged inaccessible terrain. Due to its habitat and high level of representation in reserves, logging is unlikely to pose significant threats to this assemblage in future. Frequent high intensity fires are likely to be the principal conservation issues, since the dominant tree species are killed in such events and rely on seedling regeneration. Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

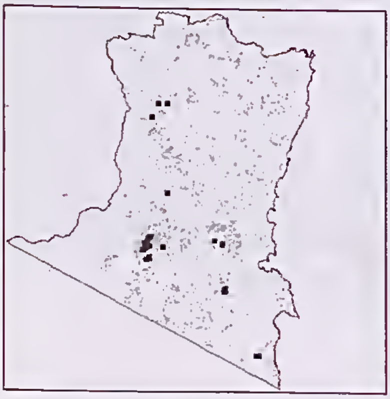
Species richness: 21 ± 1 (0.04 ha)
Extant area: 1877 ha
Proportion cleared: 0%
Number of samples: 28

Table 41a. Diagnostic plant species of Map Unit 41.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Eucalyptus fraxinoides	0.893	4(4–5)	0.012	3(2–4)	positive
Eucalyptus sieberi	0.536	2(1–3)	0.278	3(2–4)	positive
Gaultheria appressa	0.036	1(1–1)	0	0(0–0)	positive
Hierochloe rariflora	0.536	2(1–3)	0.175	2(1–3)	positive
Leucopogon lanceolatus var. *lanceolatus*	0.893	2(2–3)	0.396	1(1–2)	positive
Persoonia silvatica	0.5	2(1–2)	0.035	1(1–2)	positive
Lomandra longifolia	0.714	2(1–2)	0.546	2(1–2)	frequent
Pteridium esculentum	0.821	3(2–3)	0.572	2(1–3)	frequent
Dianella tasmanica	0.857	1(1–2)	0.223	1(1–2)	frequent
Platysace lanceolata	0.714	1(1–2)	0.242	2(1–2)	frequent
Poa meionectes	0.571	1(1–2)	0.538	2(1–3)	frequent
Angophora floribunda	0.036	3(3–3)	0.096	2(1–3)	uninformative
Eucalyptus agglomerata	0.036	3(3–3)	0.11	3(2–3)	uninformative
Eucalyptus cypellocarpa	0.107	1(1–1)	0.318	3(2–3)	uninformative
Eucalyptus fastigata	0.036	4(4–4)	0.143	3(3–4)	uninformative
Eucalyptus globoidea	0.036	2(2–2)	0.247	3(1–3)	uninformative
Eucalyptus obliqua	0.179	1(1–4)	0.19	3(2–4)	uninformative

Table 41b. Vegetation structure of Map Unit 41. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=22).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	25.3(1.1)	42(3)
Small tree	22.7	8.4(1.9)	29(9)
Shrub	100	2.4(0.3)	24(4)
Ground cover	100	0.6(0.1)	23(3)



Map 41. Distribution of samples of Mountain Intermediate Shrub Forest (Map Unit 41) shown by large black squares. Samples of other map units shown as small grey points.

Plate 41. Mountain Intermediate Shrub Forest (Map Unit 41) dominated by *Eucalyptus fraxinoides* with a sparse cover of shrubs including *Persoonia silvatica* on the upper eastern face of Mt Imlay, Mt Imlay National Park.

Table 41c. Habitat characteristics of Map Unit 41. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1116	1045–1199	28
Altitude (m)		854	740–1013	27
Slope (degrees)		20	10–29	27
Terrain class				
North	15			4
Intermediate	41			11
South	37			10
Flat	7			2
Parent material				
Devonian granitoids	68			19
Devonian high quartz sedimentaries	29			8
Ordovician high quartz sedimentaries	4			1

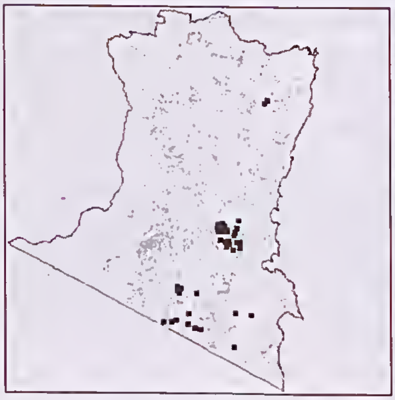
Map Unit 42: Inland Intermediate Shrub Forest

Inland Intermediate Shrub Forest is a tall forest (c. 30 m) dominated by *Eucalyptus obliqua* and *E. sieberi* sometimes with *E. cypellocarpa*. It has a relatively dense shrub stratum including *Acacia obtusifolia, Epacris impressa, Leucopogon lanceolatus, Pultenaea daphnoides* and *Persoonia linearis,* with smaller shrubs including *Goodenia ovata* and *Hibbertia aspera.* The tall semi-continuous groundcover comprises grasses and graminoids *Tetrarrhena juncea, Lomandra longifolia* and *Poa meionectes,* herbs *Gonocarpus teucrioides* and *Dianella caerulea,* and bracken *Pteridium esculentum.* Inland Intermediate Shrub Forest occurs on sheltered slopes either on metasediments or granitoid substrates at 150–650 m elevation in the coastal ranges and hinterland south from Merimbula. No similar assemblages are known to the north (Austin 1978, CSIRO 1996), while the most similar assemblage described in East Gippsland (Community 16.5, Forbes et al. 1982) shares few of the major understorey species and has relatively higher and lower frequencies of *E. globoidea* and *E. cypellocarpa*, respectively. Relatively little Inland Intermediate Shrub Forest has been cleared, most occurring on public land within production forest, while about one-quarter is reserved. The principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 30 ± 1 (0.04 ha)
Extant area: 21 429 ha
Proportion cleared: 2%
Number of samples: 64

Table 42a. Diagnostic plant species of Map Unit 42.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia aculeatissima	0.016	1(1–1)	0	0(0–0)	positive
Acacia obtusifolia	0.547	3(3–3)	0.068	3(2–3)	positive
Epacris impressa	0.641	2(1–2)	0.176	2(1–2)	positive
Eucalyptus obliqua	0.672	3(1–3)	0.168	3(2–4)	positive
Eucalyptus sieberi	0.797	3(3–4)	0.259	3(2–4)	positive
Gonocarpus teucrioides	0.875	3(2–3)	0.291	1(1–2)	positive
Lepidosperma elatius	0.016	1(1–1)	0	0(0–0)	positive
Leucopogon lanceolatus var. *lanceolatus*	0.813	2(1–2)	0.387	1(1–2)	positive
Pultenaea daphnoides	0.75	2(1–3)	0.067	1(1–2)	positive
Tetrarrhena juncea	0.672	2(2–3)	0.16	2(1–3)	positive
Lomandra longifolia	0.578	2(1–2)	0.548	2(1–2)	frequent
Poa meionectes	0.672	2(1–2)	0.533	2(1–3)	frequent
Pteridium esculentum	0.938	3(2–3)	0.56	2(1–3)	frequent
Billardiera scandens	0.828	1(1–1)	0.306	1(1–1)	frequent
Dianella caerulea	0.672	1(1–2)	0.261	1(1–2)	frequent
Persoonia linearis	0.844	1(1–2)	0.261	1(1–1)	frequent
Angophora floribunda	0.016	2(2–2)	0.099	2(1–3)	uninformative
Eucalyptus agglomerata	0.203	3(2–3)	0.104	3(2–3)	uninformative
Eucalyptus croajingolensis	0.016	2(2–2)	0.002	3(2–3)	uninformative
Eucalyptus cypellocarpa	0.438	3(1–3)	0.308	3(2–3)	uninformative
Eucalyptus elata	0.047	2(1–3)	0.116	3(2–3)	uninformative
Eucalyptus fastigata	0.031	3.5(3–4)	0.146	3(3–4)	uninformative
Eucalyptus globoidea	0.234	2(1–2)	0.243	3(1–3)	uninformative
Eucalyptus longifolia	0.016	3(3–3)	0.031	3(2–3)	uninformative
Eucalyptus muelleriana	0.234	3(3–3)	0.138	3(2–4)	uninformative
Eucalyptus radiata	0.094	2(1–2)	0.076	3(1–3)	uninformative
Eucalyptus smithii	0.031	2.5(1–4)	0.046	2(1–3)	uninformative
Eucalyptus sp. aff. *radiata*	0.047	4(3–4)	0.035	3(2–3)	uninformative



Map 42. Distribution of samples of Coastal Intermediate Shrub Forest (Map Unit 42) shown by large black squares. Samples of other map units shown as small grey points.

Plate 42. Coastal Intermediate Shrub Forest (Map Unit 42) dominated by *Eucalyptus obliqua* and *E. sieberi* with *Acacia terminalis, A. longifolia, Pultenaea daphnoides* and *Pteridium esculentum* on Poole Fire Trail near Mt Poole Flora Reserve in Yambulla State Forest.

Table 42b. Vegetation structure of Map Unit 42. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=16).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	29.3(1.5)	37(2)
Small tree	12.5	12.0(3.0)	21(19)
Shrub	100	3.3(0.4)	39(4)
Ground cover	100	0.9(0.1)	56(7)

Table 42c. Habitat characteristics of Map Unit 42. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		993	952–1031	64
Altitude (m)		418	330–540	39
Slope (degrees)		13	7–17	32
Terrain class				
North	16			5
Intermediate	34			11
South	47			15
Flat	3			1
Parent material				
Devonian Basalt	2			1
Devonian granitoids	69			44
Devonian high quartz sedimentaries	11			7
Low quartz sedimentaries	13			8
Ordovician high quartz sedimentaries	6			4

Map Unit 43: Mountain Sandstone Shrub Forest

Mountain Sandstone Shrub Forest is dominated by *Eucalyptus cypellocarpa, E. globoidea* and *E. sieberi* up to 25 m tall. It may have two prominent sclerophyllous shrub strata 1–5 m tall including *Acacia falciformis, Daviesia ulicifolia, Epacris impressa, Exocarpos strictus, Leucopogon lanceolatus, Persoonia linearis, Platysace lanceolata* and *Olearia erubescens.* The open groundcover comprises grasses and graminoids *Lomandra longifolia* and *Poa meionectes,* herbs *Gonocarpus teucrioides, Dianella caerulea, Viola hederacea* and *Senecio* sp. E, and bracken *Pteridium esculentum.* Mountain Sandstone Shrub Forest occurs on ridges and upper slopes associated with Nungatta Mountain at 400–900 m elevation. Here, the substrate is Genoa Sandstone and underlying mudstones, although outlying stands occur on granitoid ridges on the escarpment range (Nalbaugh Plateau and Big Jack Mountain). This assemblage differs from Sandstone Dry Shrub Forest (Map Unit 25) in its lack of *E. obliqua* and *E.* sp. aff. *radiata* which are substituted by other tree species, its different shrub composition and its shorter and more open groundcover. Although Mountain Sandstone Shrub Forest does not readily match any assemblages described in East Gippsland (Forbes et al. 1982), similar assemblages might occur within the dry sclerophyll forest complex (Woodgate et al. 1994) on Genoa sandstones across the border in the Coopracambra area. A negligible proportion of this assemblage has been cleared and almost all is represented within national parks. The principal threat is frequent fire regimes that may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 34 ± 2 (0.04 ha)
Extant area: 2484 ha
Proportion cleared: 1%
Number of samples: 13

Table 43a. Diagnostic plant species of Map Unit 43.

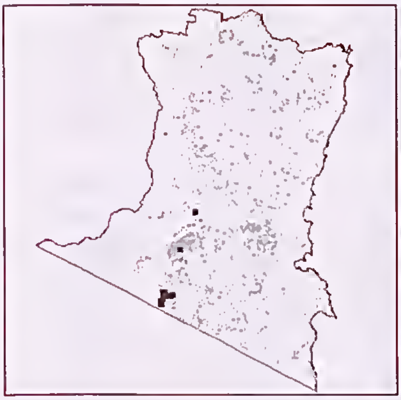
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia falciformis	0.846	3(2–4)	0.184	2(1–3)	positive
Asterolasia asteriscophora	0.077	3(3–3)	0	0(0–0)	positive
Daviesia ulicifolia	0.539	2(1–2)	0.055	1.5(1–2)	positive
Deyeuxia nudiflora	0.077	1(1–1)	0	0(0–0)	positive
Dianella caerulea	0.539	2(1–2)	0.276	1(1–2)	positive
Epacris impressa	0.769	2(1–2)	0.191	2(1–2)	positive
Eucalyptus cypellocarpa	0.923	3(1–3)	0.308	3(2–3)	positive
Eucalyptus globoidea	0.692	2(1–3)	0.239	3(1–3)	positive
Eucalyptus sieberi	0.692	3(3–4)	0.279	3(2–4)	positive
Exocarpos strictus	0.846	2(1–3)	0.165	1(1–2)	positive
Gonocarpus teucrioides	0.769	2(1–2)	0.312	2(1–2)	positive
Leucopogon lanceolatus var. *lanceolatus*	0.923	2(2–2)	0.401	1(1–2)	positive
Persoonia linearis	0.846	2(1–2)	0.281	1(1–1)	positive
Platysace lanceolata	1	3(2–4)	0.245	2(1–2)	positive
Viola hederacea subsp. *hederacea*	0.692	2(1–2)	0.435	2(1–2)	positive
Lomandra longifolia	0.846	2(1–2)	0.546	2(1–2)	frequent
Poa meionectes	0.769	2.5(2–3)	0.537	2(1–3)	frequent
Pteridium esculentum	0.692	2(2–3)	0.576	2(1–3)	frequent
Olearia erubescens	0.615	1(1–2)	0.062	1(1–1)	frequent
Senecio sp. E	0.692	1(1–2)	0.189	1(1–2)	frequent
Eucalyptus agglomerata	0.308	3(3–3)	0.107	3(2–3)	uninformative
Eucalyptus angophoroides	0.154	2.5(1–4)	0.043	2(1–3)	uninformative
Eucalyptus elata	0.154	2.5(2–3)	0.112	3(2–3)	uninformative
Eucalyptus mackintii	0.231	3(3–3)	0.002	4(3–4)	uninformative
Eucalyptus muelleriana	0.154	3(2–4)	0.142	3(2–4)	uninformative
Eucalyptus obliqua	0.077	4(4–4)	0.191	3(2–4)	uninformative
Eucalyptus sp. aff. *radiata*	0.077	2(2–2)	0.035	3(2–3)	uninformative

Table 43b. Vegetation structure of Map Unit 43. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=12).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	23.8(1.9)	35(2)
Small tree	41.7	4.9(1.1)	37(3)
Shrub	100	1.3(0.2)	40(4)
Ground cover	100	0.5(0.1)	34(6)

Table 43c. Habitat characteristics of Map Unit 43. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1065	1014–1131	13
Altitude (m)		632	490–740	13
Slope (degrees)		19	15–24	13
Terrain class				
North	8			1
Intermediate	62			8
South	23			3
Flat	8			1
Parent material				
Devonian granitoids	23			3
Devonian high quartz sedimentaries	77			10



Map 43. Distribution of samples of Mountain Sandstone Dry Shrub Forest (Map Unit 43) shown by large black squares. Samples of other map units shown as small grey points.

Plate 43. Mountain Sandstone Dry Shrub Forest (Map Unit 43) dominated by *Eucalyptus sieberi* and *E. cypellocarpa* with *Persoonia linearis, Podolobium ilicifolium, Epacris impressa* and *Acacia falciformis* on the western rim of Nungatta Plateau, Genoa section of South East Forests National Park.

Map Unit 44: Foothills Dry Shrub Forest

Foothills Dry Shrub Forest is dominated by *Eucalyptus sieberi* sometimes with *E. globoidea* up to 25 m tall. It has an open sclerophyllous shrub stratum including *Acacia falciformis, Leucopogon lanceolatus, Persoonia linearis* and *Platysace lanceolata*. The groundcover comprises scattered grasses and graminoids *Hierochloe rariflora, Tetrarrhena juncea, Lomandra longifolia* and *Poa meionectes*, herbs *Poranthera microphylla* and *Viola hederacea*, and bracken *Pteridium esculentum*. Foothills Dry Shrub Forest occurs on exposed ridges and slopes usually at 500–900 m elevation on granitoid substrates or more rarely on metasediments. Occurrences are scattered widely on the coastal and escarpment ranges. Similar assemblages occur both north (Austin 1978, CSIRO 1996) and south within the shrubby dry forest complex (Ecological Vegetation Class 21, Woodgate et al. 1994). Relatively little Foothills Dry Shrub Forest has been cleared, most being reserved while about one-quarter occurs within production forest. The principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 30 ± 1 (0.04 ha)
Extant area: 3152 ha
Proportion cleared: 6%
Number of samples: 29

Table 44a. Diagnostic plant species of Map Unit 44.

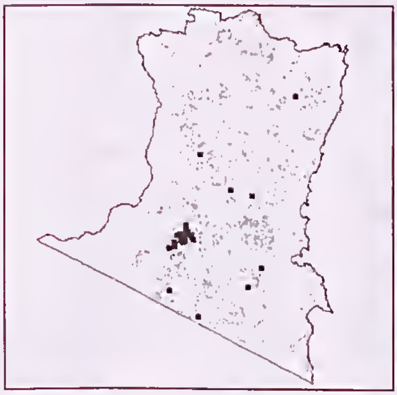
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia falciformis	0.759	2(2–3)	0.178	2(1–3)	positive
Actinotus minor	0.034	1(1–1)	0	0(0–0)	positive
Eucalyptus sieberi	1	4(3–4)	0.268	3(2–4)	positive
Hierochloe rariflora	0.724	2(2–4)	0.171	2(1–3)	positive
Leucopogon lanceolatus var. *lanceolatus*	0.897	2(1–2)	0.396	1(1–2)	positive
Tetrarrhena juncea	0.517	2(1–2)	0.175	2(1–3)	positive
Lomandra longifolia	1	2(1–2)	0.54	2(1–2)	frequent
Poa meionectes	0.724	2(1–3)	0.535	2(1–3)	frequent
Pteridium esculentum	1	3(2–3)	0.568	2(1–3)	frequent
Persoonia linearis	0.828	1(1–2)	0.275	1(1–2)	frequent
Platysace lanceolata	0.655	1(1–2)	0.243	2(1–2)	frequent
Poranthera microphylla	0.69	1(1–2)	0.214	1(1–1)	frequent
Viola hederacea subsp. *hederacea*	0.621	1(1–2)	0.434	2(1–2)	frequent
Eucalyptus agglomerata	0.069	2.5(2–3)	0.11	3(2–3)	uninformative
Eucalyptus cypellocarpa	0.241	1(1–3)	0.315	3(2–3)	uninformative
Eucalyptus elata	0.103	1(1–4)	0.113	3(2–3)	uninformative
Eucalyptus fastigata	0.034	1(1–1)	0.143	3(3–4)	uninformative
Eucalyptus globoidea	0.414	1.5(1–4)	0.239	3(1–3)	uninformative
Eucalyptus muelleriana	0.034	3(3–3)	0.144	3(2–4)	uninformative
Eucalyptus obliqua	0.276	3(2–4)	0.188	3(2–4)	uninformative
Eucalyptus radiata	0.034	1(1–1)	0.078	3(1–3)	uninformative
Eucalyptus smithii	0.034	2(2–2)	0.046	2(1–3)	uninformative
Eucalyptus sp. aff. *radiata*	0.138	3(2–3)	0.033	3(2–3)	uninformative

Table 44b. Vegetation structure of Map Unit 44. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=21).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	24.5(1.0)	41(2)
Small tree	9.5	10.0(0.0)	15(10)
Shrub	100	2.7(0.2)	24(4)
Ground cover	100	0.7(0.1)	28(5)

Table 44c. Habitat characteristics of Map Unit 44. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1033	992–1080	29
Altitude (m)		700	600–850	29
Slope (degrees)		13	3–22	28
Terrain class				
North	41			11
Intermediate	22			6
South	4			1
Flat	33			9
Parent material				
Devonian granitoids	83			24
Devonian high quartz sedimentaries	10			3
Ordovician high quartz sedimentaries	7			2



Map 44. Distribution of samples of Foothills Dry Shrub Forest (Map Unit 44) shown by large black squares. Samples of other map units shown as small grey points.

Plate 44. Foothills Dry Shrub Forest (Map Unit 44) dominated by *Eucalyptus sieberi* with occasional *E. cypellocarpa* and *Acacia falciformis, Leucopogon lanceolatus* and *Poa meionectes* near Mt Calabash, Coolangubra State Forest.

Map Unit 45: Mountain Dry Shrub Forest

Mountain Dry Shrub Forest is dominated by *Eucalyptus sieberi* usually in pure stands c. 20 m tall. It has a prominent sclerophyllous shrub stratum including *Acacia terminalis, Leucopogon lanceolatus, Lomatia ilicifolia, Monotoca scoparia, Platysace lanceolata* and *Persoonia linearis.* The sparse groundcover includes *Lomandra longifolia* and *Pteridium esculentum.* Mountain Dry Shrub Forest occurs on exposed stony ridges and upper slopes at 600–1000 m elevation on granitoid substrates or more rarely on metasediments on the escarpment range and hinterland mountains. It differs from Foothills Dry Shrub Forest (Map Unit 44) in the composition of its shrub stratum, the low frequency of co-dominant tree species and its less developed ground stratum. Similar assemblages occur both north (Austin 1978, CSIRO 1996) and south within the shrubby dry forest complex (Ecological Vegetation Class 21, Woodgate et al. 1994). A negligible area of Mountain Dry Shrub Forest has been cleared, over half being reserved while the remainder occurs within production forest on private and public land. The principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 29 ± 3 (0.04 ha)
Extant area: 1930 ha
Proportion cleared: 5%
Number of samples: 23

Table 45a. Diagnostic plant species of Map Unit 45.

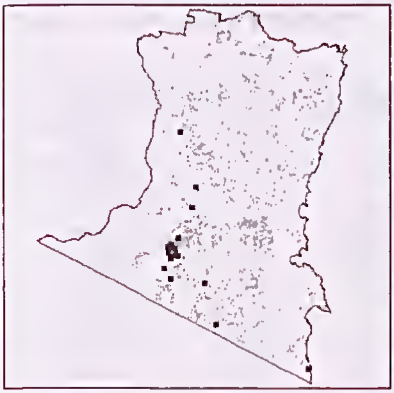
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia terminalis	0.826	3(1–3)	0.108	2(1–3)	positive
Eucalyptus sieberi	1	4(4–4)	0.271	3(2–4)	positive
Leucopogon lanceolatus var. *lanceolatus*	0.739	2(1–3)	0.4	1(1–2)	positive
Lomatia ilicifolia	0.913	2(1–2)	0.119	1(1–2)	positive
Monotoca scoparia	0.87	2(1–3)	0.114	2(1–2)	positive
Platysace lanceolata	0.696	2(1–2)	0.244	2(1–2)	positive
Spyridium parvifolium	0.043	2(2–2)	0	0(0–0)	positive
Lomandra longifolia	1	2(2–3)	0.542	2(1–2)	frequent
Pteridium esculentum	0.913	3(2–3)	0.571	2(1–3)	frequent
Persoonia linearis	0.696	1(1–2)	0.28	1(1–2)	frequent
Eucalyptus consideniana	0.043	3(3–3)	0.021	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.13	1(1–3)	0.317	3(2–3)	uninformative
Eucalyptus fraxinoides	0.13	3(1–4)	0.027	4(3–4)	uninformative
Eucalyptus globoidea	0.217	2(1–5)	0.243	3(1–3)	uninformative
Eucalyptus obliqua	0.261	2(1–3)	0.188	3(2–4)	uninformative
Eucalyptus radiata	0.043	1(1–1)	0.077	3(1–3)	uninformative
Eucalyptus sp. aff. *radiata*	0.174	1(1–3)	0.033	3(2–3)	uninformative
Poa meionectes	0.478	2(1–2)	0.54	2(1–3)	negative

Table 45b. Vegetation structure of Map Unit 45. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=15).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	21.4(2.0)	38(3)
Small tree	20	6.0(1.5)	18(11)
Shrub	100	1.6(0.2)	34(3)
Ground cover	100	0.5(0.1)	21(5)

Table 45c. Habitat characteristics of Map Unit 45. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≥ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1047	986–1104	23
Altitude (m)		737	608–950	2
Slope (degrees)		11	3–18	23
Terrain class				
North	30			7
Intermediate	35			8
South	4			1
Flat	30			7
Parent material				
Devonian granitoids	87			20
Low quartz sedimentaries	4			1
Ordovician high quartz sedimentaries	4			1
Tertiary Alluvium	4			1



Map 45. Distribution of samples of Mountain Dry Shrub Forest (Map Unit 45) shown by large black squares. Samples of other map units shown as small grey points.

Plate 45. Mountain Dry Shrub Forest (Map Unit 45) dominated by *Eucalyptus sieberi* with *Lomatia ilicifolia, Hibbertia hermanniifolia, Lomandra longifolia* amd *Poa meionectes* near Mt Cathcart, Cathcart State Forest.

Map Unit 46A: Timbillica Dry Shrub Forest

Timbillica Dry Shrub Forest is c. 25 m tall dominated by *Eucalyptus consideniana, E. sieberi* and *E. agglomerata,* sometimes with *E. globoidea* and an open small tree stratum of *Allocasuarina littoralis* c. 8 m tall. Its prominent sclerophyllous shrub stratum includes *Acacia terminalis, Epacris impressa, Hibbertia empetrifolia, Monotoca scoparia, Tetratheca pilosa, Platysace lanceolata* and *Persoonia linearis.* The groundcover is dominated by grasses and graminoids *Caustis flexuosa, Gahnia radula, Tetrarrhena juncea, Lomandra longifolia, Poa meionectes* and *Lepidosperma laterale,* herbs *Gonocarpus teucrioides* and *Patersonia glabrata,* and bracken *Pteridium esculentum.* Vines of *Billardiera scandens* twine among the shrubs and groundcover. Timbillica Dry Shrub Forest occupies low ridges and slopes in undulating granitoid terrain at 50–300 m elevation in the middle to lower reaches of the Wallagaraugh River catchment. A similar assemblage occurs east of Cann River in the lowlands of East Gippsland (Community 16.2, Forbes et al. 1982), although *E. consideniana* is less frequent and some differences in understorey composition (e.g. more abundant Proteaceae) are apparent. Negligible amounts of Timbillica Dry Shrub Forest have been cleared, and although numerous small patches are reserved mainly along the corridor within Wallagaraugh River Flora Reserve, most occurs within production forest. The principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 36 ± 0 (0.04 ha)
Extant area: 22 797 ha
Proportion cleared: 1%
Number of samples: 24

Table 46Aa. Diagnostic plant species of Map Unit 46A.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia lanigera	0.083	2.5(2–3)	0	0(0–0)	positive
Acacia terminalis	0.583	2(1–2)	0.112	2(1–3)	positive
Allocasuarina littoralis	0.542	3(1–3)	0.158	2(1–3)	positive
Caustis flexuosa	0.667	2(1–2)	0.028	2(1–3)	positive
Epacris impressa	0.833	2(1–2)	0.186	2(1–2)	positive
Eucalyptus agglomerata	0.583	3(3–3)	0.101	3(2–3)	positive
Eucalyptus consideniana	0.833	3(1–3)	0.008	2(1–3)	positive
Eucalyptus sieberi	0.667	2.5(1–3)	0.276	3(2–4)	positive
Gahnia radula	0.625	2(2–3)	0.082	2(1–3)	positive
Gonocarpus teucrioides	0.958	2(2–2)	0.305	2(1–2)	positive
Hibbertia empetrifolia	0.583	2(1–2)	0.057	1(1–2)	positive
Lasiopetalum ferrugineum var. *cordatum*	0.083	1.5(1–2)	0	0(0–0)	positive
Monotoca scoparia	0.833	2(1–3)	0.114	2(1–2)	positive
Platysace lanceolata	0.542	2(2–2)	0.247	2(1–2)	positive
Pomaderris andromedifolia	0.083	1.5(1–2)	0	0(0–0)	positive
Pomaderris discolor	0.042	1(1–1)	0	0(0–0)	positive
Tetrarrhena juncea	0.5	2(1–2)	0.177	2(1–3)	positive
Tetratheca pilosa subsp. *latifolia*	0.625	2(1–2)	0.017	1(1–2)	positive
Poa meionectes	0.792	2(1–2)	0.535	2(1–3)	frequent
Pteridium esculentum	0.958	2(2–3)	0.57	2(1–3)	frequent
Billardiera scandens	0.625	1(1–1)	0.324	1(1–1)	frequent
Lepidosperma laterale	0.917	1.5(1–2)	0.335	1(1–2)	frequent
Patersonia glabrata	0.917	1.5(1–2)	0.053	1(1–2)	frequent
Persoonia linearis	0.917	1(1–1)	0.276	1(1–2)	frequent
Callitris rhomboidea	0.042	1(1–1)	0.003	1(1–2)	uninformative
Eucalyptus angophoroides	0.167	2(1–3)	0.042	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.042	1(1–1)	0.318	3(2–3)	uninformative
Eucalyptus globoidea	0.458	2(1–3)	0.239	3(1–3)	uninformative

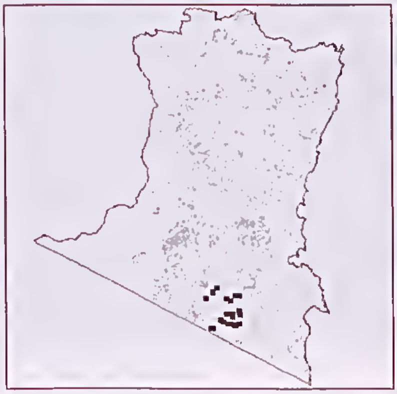
Eucalyptus muelleriana	0.042	3(3–3)	0.144	3(2–4)	uninformative
Eucalyptus obliqua	0.083	1(1–1)	0.191	3(2–4)	uninformative
Eucalyptus radiata	0.083	3(3–3)	0.077	3(1–3)	uninformative
Eucalyptus sp. aff. *radiata*	0.042	3(3–3)	0.035	3(2–3)	uninformative
Eucalyptus viminalis	0.042	1(1–1)	0.057	3(1–3)	uninformative
Lomandra longifolia	0.208	2(1–2)	0.555	2(1–2)	negative

Table 46Ab. Vegetation structure of Map Unit 46A. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=19).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	26.6(1.5)	24(1)
Small tree	52.6	8.1(1.1)	18(4)
Shrub	100	1.9(0.3)	21(3)
Ground cover	100	0.6(0.0)	13(2)

Table 46Ac. Habitat characteristics of Map Unit 46A. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		926	886–966	24
Altitude (m)		264	185–338	19
Slope (degrees)		6	3–10	19
Terrain class				
North	26			5
Intermediate	26			5
South	11			2
Flat	37			7
Parent material				
Devonian granitoids	100			24

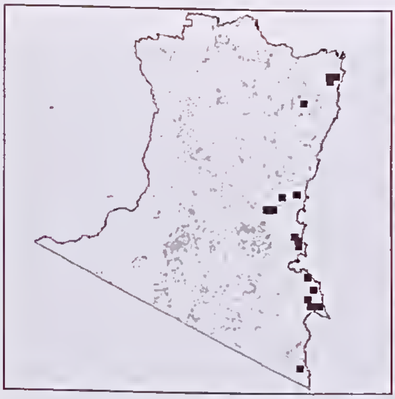


Map 46A. Distribution of samples of Timbillica Dry Shrub Forest (Map Unit 46A) shown by large black squares. Samples of other map units shown as small grey points.

Plate 46A. Timbillica Dry Shrub Forest (Map Unit 46A) dominated by *Eucalyptus consideniana* with *Allocasuarina littoralis, Hakea decurrens* ssp. *physocarpa, Daviesia buxifolia, Leptospermum trinervium* and *Acacia terminalis* on Imlay Road near Imlay Creek crossing, Yambulla State Forest.

Map Unit 46B: Lowland Dry Shrub Forest

Lowland Dry Shrub Forest is dominated by *Corymbia gummifera*, *Eucalyptus sieberi* and *E. globoidea* over 20 m tall, sometimes with *Angophora floribunda* and an open small tree stratum of *Allocasuarina littoralis* 8m tall. It has a diverse sclerophyllous shrub stratum including *Acacia terminalis, Bossiaea obcordata, Gompholobium glabratum, Leptospermum trinervium, Pimelea linifolia, Platysace lanceolata, Correa reflexa, Persoonia linearis* and several less frequent species including *Banksia spinulosa* and *Platylobium formosum*. The groundcover comprises scattered grasses *Chionochloa pallida* and *Entolasia stricta* (and *Anisopogon avenaceus* at lower frequency), herbs *Gonocarpus teucrioides, Patersonia glabrata* and *Xanthosia pilosa*, and bracken *Pteridium esculentum*. Lowland Dry Shrub Forest occurs on low ridges and moderate dry slopes in the coastal foothills and plains usually below 150 m elevation on metasediments or Tertiary alluvium. Some of these latter sites with deep sandy soils support relatively tall forest dominated by *E. pilularis*. A similar assemblage extends further north along the coastal strip at least as far as Bodalla (Austin 1978). The most similar assemblage in East Gippsland (Community 15.1, Forbes et al. 1982) has more restricted occurrences of *C. gummifera* and some differences in understorey composition (e.g. lower frequencies of *Bossiaea obcordata* and *Chionochloa pallida*, higher frequency of *Banksia serrata*). Significant occurrences of Lowland Dry Shrub Forest remain on all tenures, relatively little having been cleared. Although a few stands are threatened by coastal development and overuse, the principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.



Map 46B. Distribution of samples of Mountain Intermediate Shrub Forest (Map Unit 46B) shown by large black squares. Samples of other map units shown as small grey points.

Plate 46Ba. Lowland Dry Shrub Forest (Map Unit 46B) dominated by *Corymbia gummifera* and *E. sieberi* with *Banksia spinulosa, B. serrata, Pimelea linifolia* and *Acacia obtusifolia* north of Bellbird Creek in northern section of Ben Boyd National Park.

Plate 46Bb. Lowland Dry Shrub Forest (Map Unit 46B) variant dominated by *Eucalyptus pilularis* and *Corymbia gummifera* with tall *Banksia serrata, Acacia obtusifolia* and *Pteridium esculentum* north of Bellbird Creek in northern section of Ben Boyd National Park.

Species richness: 35 ± 2 (0.04 ha)
Extant area: 15 428 ha
Proportion cleared: 6%
Number of samples: 19

Table 46Ba. Diagnostic plant species of Map Unit 46B.

Species frequency	Target C/A	Target frequency	Residual C/A	Residual class	Fidelity
Acacia terminalis	0.842	2(1–3)	0.11	2(1–3)	positive
Allocasuarina littoralis	0.579	2(2–4)	0.159	2(1–3)	positive
Bossiaea obcordata	0.526	2(2–2)	0.021	2(2–3)	positive
Chionochloa pallida	0.579	3(3–4)	0.098	2(1–3)	positive
Corymbia gummifera	0.632	3(3–4)	0.012	3(2–3)	positive
Entolasia stricta	0.526	2(1–2)	0.177	1(1–2)	positive
Eucalyptus globoidea	0.526	2.5(1–3)	0.239	3(1–3)	positive
Eucalyptus sieberi	0.79	3(2–4)	0.276	3(2–4)	positive
Gompholobium glabratum	0.105	1.5(1–2)	0	0(0–0)	positive
Gonocarpus teucrioides	0.842	2(2–2)	0.309	2(1–2)	positive
Grevillea baueri	0.053	2(2–2)	0	0(0–0)	positive
Leptospermum trinervium	0.526	2(1–2)	0.023	2(1–3)	positive
Patersonia glabrata	0.737	2(2–2)	0.059	1(1–2)	positive
Pimelea linifolia subsp. *linifolia*	0.632	2(1–2)	0.03	1(1–2)	positive
Platysace lanceolata	0.737	2(2–2)	0.245	2(1–2)	positive
Xanthosia pilosa	0.579	2(1–2)	0.052	1(1–2)	positive
Pteridium esculentum	0.842	3(1–4)	0.573	2(1–3)	frequent
Correa reflexa	0.737	1(1–2)	0.119	1(1–2)	frequent
Persoonia linearis	0.895	1(1–2)	0.278	1(1–1)	frequent
Angophora floribunda	0.316	1.5(1–2)	0.092	2(1–3)	uninformative
Eucalyptus agglomerata	0.158	3(1–3)	0.108	3(2–3)	uninformative
Eucalyptus consideniana	0.105	2.5(2–3)	0.02	2(1–3)	uninformative
Eucalyptus muelleriana	0.053	2(2–2)	0.143	3(2–4)	uninformative
Eucalyptus pilularis	0.105	4(4–4)	0.002	1(1–3)	uninformative
Lomandra longifolia	0.316	1(1–3)	0.552	2(1–2)	negative
Poa meionectes	0.211	2(1–3)	0.543	2(1–3)	negative

Table 46Bb. Vegetation structure of Map Unit 46B. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=15).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	22.1(1.3)	30(3)
Small tree	66.7	8.3(0.8)	21(4)
Shrub	100	1.7(0.3)	30(4)
Ground cover	100	0.5(0.0)	40(4)

Table 46Bc. Habitat characteristics of Map Unit 46B. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		887	860–915	19
Altitude (m)		104	65–135	19
Slope (degrees)		8	4–12	19
Terrain class				
North	5			1
Intermediate	42			8
South	16			3
Flat	37			7
Parent material				
Devonian granitoids	5			1
Devonian high quartz sedimentaries	58			11
Ordovician high quartz sedimentaries	16			3
Tertiary Alluvium	21			4

Map Unit 47: Eden Dry Shrub Forest

Eden Dry Shrub Forest is dominated by *Eucalyptus sieberi* and *Angophora floribunda* c. 20 m tall, with an open stratum of small trees, *Allocasuarina littoralis* c. 6 m tall. It has an open sclerophyllous shrub stratum including *Acacia terminalis, Epacris impressa, Pultenaea daphnoides, Leucopogon lanceolatus, Persoonia linearis* and *Platysace lanceolata.* The groundcover comprises grasses and graminoids *Gahnia radula* and *Tetrarrhena juncea,* herbs *Gonocarpus teucrioides, Xanthosia pilosa* and *Dianella caerulea,* and bracken *Pteridium esculentum.* Eden Dry Shrub Forest occupies coastal mountain ridges and coastal plateaux up to 800 m elevation on metasediments from the Nadgee coast to Mt Imlay. Although no similar assemblages have been explicitly described outside the Eden region (Austin 1978, Forbes et al. 1982), one may exist within the lowland sclerophyll forest complex in East Gippsland (Ecological Vegetation Class 16, Woodgate et al. 1994). Relatively little Eden Dry Shrub Forest has been cleared, most being reserved while about one-quarter occurs within public and private production forest. The principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided. Two intense fires occurred within 8 years over a large portion of the range of Eden Dry Shrub Forest in the 1970's. A long fire-free interval may therefore be necessary to ensure population recovery of some species and restoration of vegetation structure.

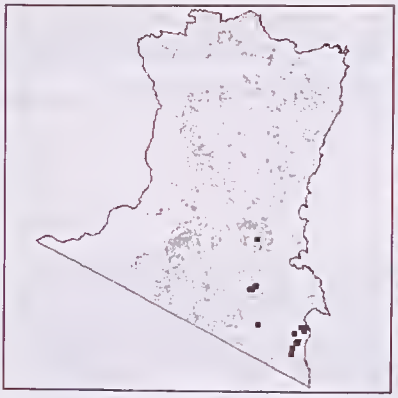
Species richness: 26 ± 1 (0.04 ha)
Extant area: 17 246 ha
Proportion cleared: 4%
Number of samples: 19

Table 47a. Diagnostic plant species of Map Unit 47.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia terminalis	0.79	3(2–4)	0.111	2(1–3)	positive
Allocasuarina littoralis	0.684	2(1–4)	0.158	2(1–3)	positive
Angophora floribunda	0.526	3(2–3)	0.089	2(1–3)	positive
Epacris impressa	0.79	2(2–3)	0.189	2(1–2)	positive
Eucalyptus sieberi	0.895	3(3–4)	0.275	3(2–4)	positive
Gahnia radula	0.737	2(2–3)	0.083	2(1–3)	positive
Gonocarpus teucrioides	0.79	2(2–3)	0.31	2(1–2)	positive
Hibbertia saligna	0.053	2(2–2)	0	0(0–0)	positive
Pultenaea daphnoides	0.526	2(1–2)	0.091	1(1–2)	positive
Tetrarrhena juncea	0.737	3(2–3)	0.175	2(1–3)	positive
Xanthosia pilosa	0.79	2(1–2)	0.05	1(1–2)	positive
Pteridium esculentum	0.947	3(2–3)	0.572	2(1–3)	frequent
Dianella caerulea	0.632	1(1–2)	0.274	1(1–2)	frequent
Leucopogon lanceolatus var. *lanceolatus*	0.684	1(1–2)	0.402	1(1–2)	frequent
Persoonia linearis	0.684	1(1–2)	0.281	1(1–2)	frequent
Platysace lanceolata	0.947	1.5(1–2)	0.242	2(1–2)	frequent
Acacia subporosa	0.053	1(1–1)	0.004	2(1–2)	uninformative
Eucalyptus agglomerata	0.158	1(1–3)	0.108	3(2–3)	uninformative
Eucalyptus baxteri	0.053	3(3–3)	0.008	3(2–3)	uninformative
Eucalyptus elata	0.053	1(1–1)	0.114	3(2–3)	uninformative
Eucalyptus globoidea	0.105	2.5(2–3)	0.244	3(1–3)	uninformative
Eucalyptus longifolia	0.053	3(3–3)	0.03	3(2–3)	uninformative
Eucalyptus muelleriana	0.053	3(3–3)	0.143	3(2–4)	uninformative
Eucalyptus obliqua	0.105	1.5(1–2)	0.191	3(2–4)	uninformative
Eucalyptus smithii	0.053	3(3–3)	0.045	2(1–3)	uninformative
Lomandra longifolia	0.474	2(1–3)	0.55	2(1–2)	negative
Poa meionectes	0.158	1(1–2)	0.544	2(1–3)	negative

Table 47b. Vegetation structure of Map Unit 47. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=19).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	20.2(1.5)	21(3)
Small tree	47.4	5.6(0.9)	30(9)
Shrub	100	2.5(0.3)	40(4)
Ground cover	100	0.8(0.1)	42(6)



Map 47. Distribution of samples of Eden Dry Shrub Forest (Map Unit 47) shown by large black squares. Samples of other map units shown as small grey points.

Plate 47. Eden Dry Shrub Forest (Map Unit 47) dominated by *Angophora floribunda* and *E. sieberi* with *Allocasuarina littoralis* and *Acacia falciformis* in the upper Merrica River catchment, Nadgee Nature Reserve.

Table 47c. Habitat characteristics of Map Unit 47. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1031	949–1089	19
Altitude (m)		372	195–525	19
Slope (degrees)		13	6–21	19
Terrain class				
North	21			4
Intermediate	37			7
South	26			5
Flat	16			3
Parent material				
Devonian high quartz sedimentaries	95			18
Tertiary Alluvium	5			1

Map Unit 48: Mumbulla Dry Shrub Forest

Mumbulla Dry Shrub Forest is dominated by *Eucalyptus sieberi*, occasionally with *E. agglomerata* c. 20 m tall. Often there is an open stratum of small trees, *Allocasuarina littoralis* 6 m tall. It has a sparse sclerophyllous shrub stratum with *Bossiaea obcordata, Persoonia linearis, Platysace lanceolata* and *Correa reflexa*. The open groundcover comprises grasses and graminoids *Chionochloa pallida, Entolasia stricta, Lepidosperma urophorum, Lomandra confertifolia* ssp. *rubiginosa* and *L. multiflora*. Mumbulla Dry Shrub Forest occupies coastal mountain ridges at 150–650 m elevation on the Bega tonalite on Mumbulla and Dr George Mountains. Outlying stands may occur at Mt Imlay and the upper Wog Wog Creek area. No similar assemblages have been described in East Gippsland (Forbes et al. 1982). It seems unlikely that similar assemblages occur north of the study area due to the lack of tonalite coastal mountain habitat. A negligible area of Mumbulla Dry Shrub Forest has been cleared, most being reserved while about one-sixth occurs within production forest. The principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 28 ± 2 (0.04 ha)
Extant area: 4576 ha
Proportion cleared: 1%
Number of samples: 19

Table 48a. Diagnostic plant species of Map Unit 48.

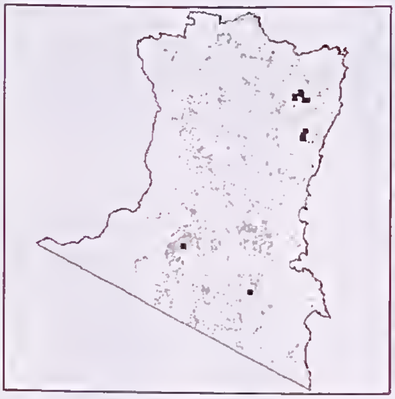
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Allocasuarina littoralis	0.842	2(1–4)	0.156	2(1–3)	positive
Bossiaea obcordata	0.579	2(2–3)	0.021	2(2–2)	positive
Chionochloa pallida	0.632	3(3–4)	0.098	2(1–3)	positive
Cryptostylis erecta	0.053	1(1–1)	0	0(0–0)	positive
Entolasia stricta	0.526	2(1–2)	0.177	1(1–2)	positive
Eucalyptus sieberi	0.895	3(3–3)	0.275	3(2–4)	positive
Helichrysum collinum	0.053	2(2–2)	0	0(0–0)	positive
Lepidosperma urophorum	0.842	2(2–3)	0.061	1(1–2)	positive
Lomandra confertifolia subsp. *rubiginosa*	0.579	2(1–2)	0.03	1(1–2)	positive
Myoporum bateae	0.053	1(1–1)	0	0(0–0)	positive
Persoonia linearis	0.947	2(1–2)	0.277	1(1–1)	positive
Platysace lanceolata	0.947	2(2–2)	0.242	2(1–2)	positive
Senna odorata	0.053	1(1–1)	0	0(0–0)	positive
Solanum cinereum	0.053	1(1–1)	0	0(0–0)	positive
Correa reflexa	0.737	1(1–2)	0.119	1(1–2)	frequent
Lomandra multiflora	0.632	1(1–1)	0.246	1(1–2)	frequent
Angophora floribunda	0.158	3(1–3)	0.094	2(1–3)	uninformative
Eucalyptus agglomerata	0.368	3(2–3)	0.105	3(2–3)	uninformative
Eucalyptus elata	0.053	1(1–1)	0.114	3(2–3)	uninformative
Eucalyptus globoidea	0.211	3(3–3)	0.243	3(1–3)	uninformative
Eucalyptus smithii	0.053	4(4–4)	0.045	2(1–3)	uninformative
Lomandra longifolia	0.158	1(1–1)	0.554	2(1–2)	negative
Poa meionectes	0.211	1(1–2)	0.543	2(1–3)	negative
Pteridium esculentum	0.421	2(1–2)	0.579	2(1–3)	negative

Table 48b. Vegetation structure of Map Unit 48. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=15).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	19.2(1.1)	23(3)
Small tree	53.3	6.6(1.1)	21(7)
Shrub	93.3	2.0(0.5)	21(6)
Ground cover	100	0.6(0.1)	29(5)

Table 48c. Habitat characteristics of Map Unit 48. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		990	942–1031	19
Altitude (m)		330	215–450	19
Slope (degrees)		19	11–31	19
Terrain class				
North	21			4
Intermediate	47			9
South	11			2
Flat	21			4
Parent material				
Devonian granitoids	84			16
Devonian high quartz sedimentaries	11			2
Ordovician high quartz sedimentaries	5			1



Map 48. Distribution of samples of Mumbulla Dry Shrub Forest (Map Unit 48) shown by large black squares. Samples of other map units shown as small grey points.

Plate 48. Mumbulla Dry Shrub Forest (Map Unit 48) dominated by *Eucalyptus sieberi* with *E. agglomerata*, *Allocasuarina littoralis*, *Acacia obtusifolia* and *Lepidosperma urophorum* on Lizard Road, Biamanga National Park.

Map Unit 49: Coastal Dry Shrub Forest

Coastal Dry Shrub Forest is dominated by *Eucalyptus sieberi* and *E. agglomerata* c. 20 m tall, sometimes with an open stratum of small trees, *Allocasuarina littoralis* 8 m tall. It has an open sclerophyllous shrub stratum including *Acacia obtusifolia*, *Monotoca scoparia*, *Podolobium ilicifolium*, *Platysace lanceolata* and *Persoonia linearis*. Vines of *Billardiera scandens* twine amongst the shrubs. The sparse groundcover comprises sclerophyll herbs *Stylidium graminifolium*, *Dianella caerulea* and *Lepidosperma laterale*. Coastal Dry Shrub Forest is widespread on coastal mountain ridges, dry slopes and coastal plateaux on metasediments at 100–500 m elevation. It may occur up to 900 m elevation on hinterland mountains (Big Jack Mountain, Mt Poole) and in the dissected terrain north of Bemboka. It differs from the more restricted Mumbulla Dry Shrub

Forest (Map Unit 48) in understorey composition and subdominant tree species and occupies different substrates. Similar vegetation extends north of the Eden region in the dissected terrain of the Wadbilliga and Tuross River catchments (Austin 1978, CSIRO 1996). Although no similar assemblages have been explicitly described in East Gippsland (Forbes et al. 1982), one may exist within the lowland sclerophyll forest complex (Ecological Vegetation Class 16, Woodgate et al. 1994). Relatively little Coastal Dry Shrub Forest has been cleared. Although the largest area remains on State Forest, substantial areas occur on all tenures. Although some areas on private land may be threatened by clearing, the principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Logging followed by regeneration burns and thinning may change the relative abundance of eucalypt species, particularly *E. sieberi* (Bridges 1983). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 28 ± 1 (0.04 ha)
Extant area: 32 240 ha
Proportion cleared: 2%
Number of samples: 52

Table 49a. Diagnostic plant species of Map Unit 49.

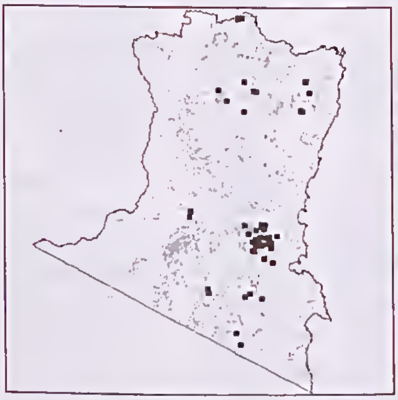
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia obtusifolia	0.667	2.5(2–3)	0.07	3(2–3)	positive
Allocasuarina littoralis	0.563	3(1–4)	0.151	2(1–3)	positive
Caleana major	0.021	1(1–1)	0	0(0–0)	positive
Eucalyptus agglomerata	0.75	3(2–3)	0.087	3(2–3)	positive
Eucalyptus sieberi	0.958	3(3–4)	0.26	3(2–4)	positive
Lobelia gibbosa	0.042	1(1–1)	0	0(0–0)	positive
Monotoca scoparia	0.625	2(1–2)	0.109	2(1–2)	positive
Podolobium ilicifolium	0.688	2(1–2)	0.059	1(1–2)	positive
Platysace lanceolata	0.771	2(2–2)	0.234	2(1–2)	positive
Stylidium graminifolium	0.5	2(1–2)	0.136	1(1–2)	positive
Billardiera scandens	0.708	1(1–1)	0.316	1(1–1)	frequent
Dianella caerulea	0.667	1(1–2)	0.265	1(1–2)	frequent
Lepidosperma laterale	0.604	1(1–1)	0.336	1(1–2)	frequent
Persoonia linearis	0.917	1(1–2)	0.265	1(1–2)	frequent
Angophora floribunda	0.146	1(1–1)	0.093	2(1–3)	uninformative
Corymbia gummifera	0.063	1(1–3)	0.019	3(2–4)	uninformative
Eucalyptus angophoroides	0.021	3(3–3)	0.045	2(1–3)	uninformative
Eucalyptus cypellocarpa	0.042	1(1–1)	0.323	3(2–3)	uninformative
Eucalyptus elata	0.021	1(1–1)	0.116	3(2–3)	uninformative
Eucalyptus globoidea	0.021	1(1–1)	0.25	3(1–3)	uninformative
Eucalyptus muelleriana	0.063	2(1–3)	0.145	3(3–4)	uninformative
Eucalyptus obliqua	0.021	1(1–1)	0.195	3(2–4)	uninformative
Eucalyptus smithii	0.083	1.5(1–3)	0.044	2(1–3)	uninformative
Eucalyptus tricarpa	0.021	1(1–1)	0.022	2(1–3)	uninformative
Lomandra longifolia	0.271	1(1–2)	0.558	2(1–2)	negative
Poa meionectes	0.188	2(1–2)	0.551	2(1–3)	negative
Pteridium esculentum	0.458	2(1–2)	0.581	2(1–3)	negative

Table 49b. Vegetation structure of Map Unit 49. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=24).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	21.5(0.9)	29(2)
Small tree	58.3	8.6(0.9)	17(4)
Shrub	95.8	2.0(0.3)	21(3)
Ground cover	100	0.6(0.1)	14(3)

Table 49c. Habitat characteristics of Map Unit 49. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		954	898–992	53
Altitude (m)		399	245–545	51
Slope (degrees)		16	10–22	50
Terrain class				
North	30			15
Intermediate	50			25
South	16			8
Flat	4			2
Parent material				
Devonian granitoids	15			8
Devonian high quartz sedimentaries	40			21
Devonian rhyolite	8			4
Low quartz sedimentaries	26			14
Ordovician high quartz sedimentaries	11			6



Map 49. Distribution of samples of Coastal Dry Shrub Forest (Map Unit 49) shown by large black squares. Samples of other map units shown as small grey points.

Plate 49. Coastal Dry Shrub Forest (Map Unit 49) dominated by *Eucalyptus sieberi* with *Acacia obtusifolia, Tetratheca thymifolia, Podolobium ilicifolium, Coopernookia barbata* and *Lomandra multiflora* on Sugarloaf Road, near The Sugarloaf, Yowaka section of South East Forests National Park.

Map Unit 50: Genoa Dry Shrub Forest

Genoa Dry Shrub Forest is dominated by *Eucalyptus agglomerata* and several minor tree species 17 m tall. It has a prominent sclerophyllous shrub stratum including *Acacia falciformis, A. terminalis, Monotoca scoparia, Podolobium ilicifolium, Persoonia linearis, Platysace lanceolata, Cassinia longifolia* and *Lomatia ilicifolia.* The sparse groundcover comprises grasses and graminoids *Chionochloa pallida, Caustis flexuosa* and *Lomandra longifolia,* herbs *Pomax umbellata* and sprawling vines of *Hardenbergia violacea.* Genoa Dry Shrub Forest is restricted to dry ridges and slopes on sandstone terrain at 300–740 m around the Genoa River and on Mt Imlay. Although no similar assemblages have been explicitly described outside the Eden region (Austin 1978, Forbes et al. 1982), Genoa Dry Shrub Forest is likely to extend across the Victorian border in the Genoa sandstone terrain within Coopracambra National Park. About one-fifth of this assemblage has been cleared for pine plantations, most of the remainder being reserved while about one-third occurs within production forest on private or public land. The principal threat is frequent disturbance regimes that include logging (outside reserves) and fire in combination. These regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned disturbances need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 21 ± 3 (0.04 ha)
Extant area: 3022 ha
Proportion cleared: 18%
Number of samples: 5

Table 50a. Diagnostic plant species of Map Unit 50.

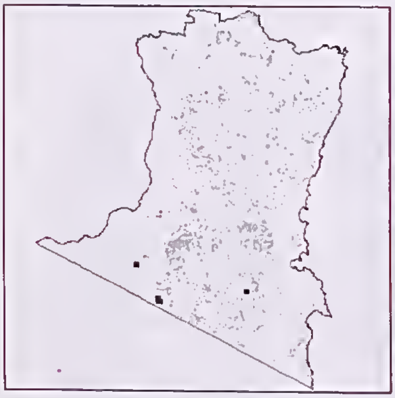
Species	**Target frequency**	**Target C/A**	**Residual frequency**	**Residual C/A**	**Fidelity class**
Acacia falciformis	0.8	2(2–4)	0.188	2(1–3)	positive
Acacia terminalis	0.6	3(2–3)	0.118	2(1–3)	positive
Chionochloa pallida	0.8	2.5(1–3)	0.102	2(2–3)	positive
Eucalyptus agglomerata	0.8	4(3–4)	0.106	3(2–3)	positive
Monotoca scoparia	1	3(2–3)	0.123	2(1–2)	positive
Podolobium ilicifolium	0.8	2(1–3)	0.077	1(1–2)	positive
Persoonia linearis	0.8	2.5(1–3)	0.284	1(1–2)	positive
Platysace lanceolata	1	2(2–2)	0.249	2(1–2)	positive
Pomax umbellata	0.8	2.5(1–3)	0.048	1(1–2)	positive
Lomandra longifolia	0.6	2(2–2)	0.549	2(1–2)	frequent
Cassinia longifolia	0.6	1(1–1)	0.187	1(1–2)	frequent
Caustis flexuosa	0.6	1(1–3)	0.037	2(1–2)	frequent
Hardenbergia violacea	0.6	1(1–3)	0.099	1(1–1)	frequent
Lomatia ilicifolia	0.8	1(1–2)	0.129	1(1–2)	frequent
Eucalyptus angophoroides	0.2	1(1–1)	0.044	2(1–3)	uninformative
Eucalyptus globoidea	0.2	3(3–3)	0.243	3(1–3)	uninformative
Eucalyptus mackintii	0.2	4(4–4)	0.003	3(3–4)	uninformative
Eucalyptus radiata	0.2	3(3–3)	0.076	3(1–3)	uninformative
Poa meionectes	0.2	1(1–1)	0.54	2(1–3)	negative
Pteridium esculentum	0.4	1.5(1–2)	0.577	2(1–3)	negative

Table 50b. Vegetation structure of Map Unit 50. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=5).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	100	17.4(1.3)	32(5)
Small tree	40	3.8(1.3)	18(3)
Shrub	100	1.2(0.3)	32(12)
Ground cover	100	0.4(0.1)	18(4)

Table 50c. Habitat characteristics of Map Unit 50. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		957	938–981	5
Altitude (m)		456	360–465	
Slope (degrees)		26	21–29	5
Terrain class				
North	40			2
Intermediate	60			3
South	0			0
Flat	0			0
Parent material				
Devonian high quartz sedimentaries	80			4
Ordovician high quartz sedimentaries	20			1



Map 50. Distribution of samples of Genoa Dry Shrub Forest (Map Unit 50) shown by large black squares. Samples of other map units shown as small grey points.

Plate 50. Genoa Dry Shrub Forest (Map Unit 50) dominated by *Eucalyptus mackintii* with *E. agglomerata* and *E. dives* and a shrubby understorey of *Hakea decurrens* ssp. *physocarpa*, *Leucopogon microphyllus*, *Caustis flexuosa* and *Pteridium esculentum* in the Genoa River gorge, Genoa section of South East Forests National Park.

Map Unit 51: Rhyolite Rock Scrub

Rhyolite Rock Scrub is dominated by dense but patchy shrub strata, 2–7 m tall, including *Kunzea ambigua*, *Melaleuca armillaris*, *Phebalium ralstonii*, *Platysace lanceolata*, *Pultenaea retusa* and *Westringia davidii*. Occasionally emergent small trees include *Allocasuarina littoralis* or rarely *Eucalyptus sieberi*, *E. agglomerata* and other eucalypt species. The groundcover comprises scattered tussocks of grasses and graminoids *Thonandia longifolia*, *Lepidosperma laterale*, *L. urophorum* and *Entolasia stricta*, and the lilioid herb *Stypandra glauca*. Rhyolite Rock Scrub is restricted to skeletal soils on outcrops of rhyolite at 100–400 m elevation on the coastal range west of Pambula. This assemblage contains a large number of rare, threatened and locally endemic species and is unique to the Eden region. Another rhyolite scrub assemblage with a different complement of rare and threatened species occurs to the north in Deua National Park. The highly restricted stands of Rhyolite Rock Scrub occur on all tenures and, although none have been cleared, they are threatened by grazing and frequent fire regimes. Occurrences on private land are subject to grazing by domestic goats, while feral goats potentially threaten stands on all tenures. Frequent fires used in hazard reduction or grazing management may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided. Post-fire seedling recruitment in shrub populations may be poor on skeletal soils if drought follows fire. Long fire-free intervals also potentially threaten Rhyolite Rock Scrub if the length of intervals exceeds the combined longevity of standing plants and seed banks. Nevertheless, particular care is needed to avoid the escape of hazard reduction fires onto the outcrops from adjacent production forest and grazing areas.

Species richness: 34 ± 4 (0.04 ha)
Extant area: 51 ha
Proportion cleared: 0%
Number of samples: 14

Table 51a. Diagnostic plant species of Map Unit 51.

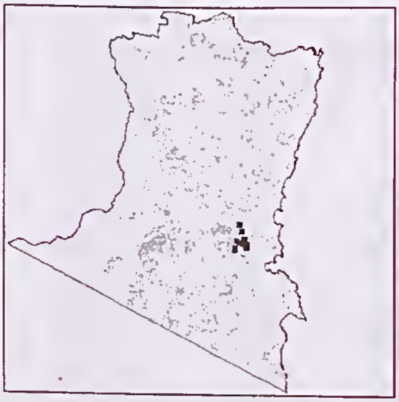
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia subtilinervis	0.143	2(2–2)	0	0(0–0)	positive
Calochilus robertsonii	0.071	1(1–1)	0	0(0–0)	positive
Cryptandra amara	0.071	3(3–3)	0	0(0–0)	positive
Kunzea ambigua	0.857	3(3–3)	0.023	2(1–3)	positive
Lepidosperma laterale	0.643	2(1–2)	0.342	1(1–2)	positive
Melaleuca armillaris	0.929	3(2–3)	0.022	3(1–4)	positive
Mirbelia pungens	0.071	1(1–1)	0	0(0–0)	positive
Myriophyllum propinquum	0.071	1(1–1)	0	0(0–0)	positive
Phebalium ralstonii	0.786	2(1–2)	0.003	1(1–3)	positive
Platysace lanceolata	0.929	2(2–2)	0.245	2(1–2)	positive
Prasophyllum rhyoliticum	0.071	1(1–1)	0	0(0–0)	positive
Prostanthera phylicifolia	0.071	3(3–3)	0	0(0–0)	positive
Pultenaea retusa	0.571	2(1–2)	0.019	1(1–2)	positive
Sticherus flabellatus	0.071	1(1–1)	0	0(0–0)	positive
Thonandia longifolia	0.714	2(1–2)	0.07	1(1–2)	positive
Westringia davidii	0.286	2(1–3)	0	0(0–0)	positive
Allocasuarina littoralis	0.929	1(1–2)	0.157	2(1–3)	frequent
Entolasia stricta	0.786	1(1–2)	0.176	1.5(1–2)	frequent
Lepidosperma urophorum	0.786	1(1–2)	0.064	1(1–2)	frequent
Stypandra glauca	0.643	1(1–1)	0.021	1(1–2)	frequent
Eucalyptus agglomerata	0.286	1(1–3)	0.107	3(2–3)	uninformative
Eucalyptus elata	0.071	1(1–1)	0.113	3(2–3)	uninformative
Eucalyptus sieberi	0.357	2(1–3)	0.282	3(2–4)	uninformative
Eucalyptus smithii	0.214	2(1–2)	0.044	2(1–3)	uninformative
Lomandra longifolia	0.214	2(1–3)	0.552	2(1–2)	negative
Poa meionectes	0.357	1(1–2)	0.541	2(1–3)	negative
Pteridium esculentum	0.143	1.5(1–2)	0.581	2(1–3)	negative

Table 51b. Vegetation structure of Map Unit 51. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=14).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	57.1	14.4(2.0)	7(2)
Small tree	71.4	6.9(0.8)	18(6)
Shrub	100	2.6(0.3)	32(6)
Ground cover	100	0.6(0.1)	8(3)

Table 51c. Habitat characteristics of Map Unit 51. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		937	881–969	14
Altitude (m)		314	210–408	14
Slope (degrees)		22	10–31	14
Terrain class				
North	36			5
Intermediate	29			4
South	14			2
Flat	21			3
Parent material				
Devonian rhyolite	100			14



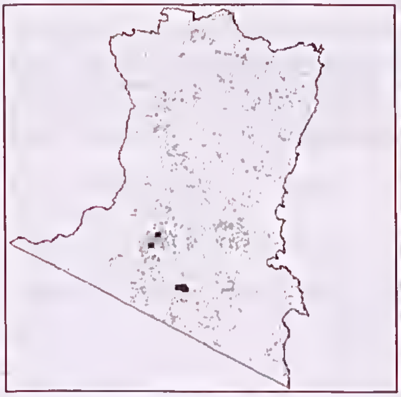
Map 51. Distribution of samples of Rhyolite Rock Scrub (Map Unit 51) shown by large black squares. Samples of other map units shown as small grey points.

Plate 51. Rhyolite Rock Scrub (Map Unit 51) open variant with *Xanthorrhoea australis*, scattered *Eucalyptus sieberi* and *Kunzea ambigua* on The Sugarloaf, Yowaka section of South East Forests National Park.

Map Unit 52: Mountain Rock Scrub

Mountain Rock Scrub is dominated by a dense but patchy shrub stratum 4 m tall, including *Kunzea ambigua*, *Hakea macreana* with *Acacia longifolia*, *Correa reflexa*, *Goodenia ovata*, *Grevillea victoriae and Platysace lanceolata*. Occasionally emergent small trees include *Eucalyptus smithii* and *E. sieberi*. The groundcover comprises scattered tussocks of graminoids *Lepidosperma laterale*, *L. urophorum* and *Lomandra glauca*, and the lilioid herb *Stypandra glauca*. Mountain Rock Scrub is restricted to skeletal soils on granitoid outcrops at 500–1000 m elevation on hinterland and escarpment mountains in the south-west (e.g. Mt Poole, White Rock Mountain, Pheasants Peak). This assemblage lacks the compliment of rare, threatened and endemic plant species characteristic of the lower elevation rhyolite outcrops (Map Unit 51), as well as including some shrub species that are absent from that assemblage. A similar assemblage has a restricted distribution on granitoid peaks in East Gippsland including Maramingo Hill, Genoa Peak and Mt Kaye. This assemblage is included within Rocky Outcrop Shrubland (Ecological Vegetation Class 28, Woodgate et al. 1994), along with other assemblages on non-granitoid substrates that share few species in common. Mountain Rock Scrub remains uncleared and is almost entirely contained within reserves. Frequent regimes fire may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided. Post-fire seedling recruitment in shrub populations may be poor on skeletal soils if drought follows fire. Long fire-free intervals also potentially threaten Mountain Rock Scrub if the length of intervals exceeds the combined longevity of standing plants and seed banks. The level of grazing by feral goats is unknown, but potentially problematic.

Species richness: 24 ± 2 (0.04 ha)
Extant area: 202 ha
Proportion cleared: 0%
Number of samples: 8



Map 52. Distribution of samples of Mountain Rock Scrub (Map Unit 52) shown by large black squares. Samples of other map units shown as small grey points.

Plate 52. Mountain Rock Scrub (Map Unit 52) with clumped stands of *Melaleuca armillaris* and *Kunzea ambigua* with *Epacris microphylla* and *Lepidosperma gunnii* on massive granitoid outcrops near Mt Poole, Mt Poole Flora Reserve.

Table 52a. Diagnostic plant species of Map Unit 52.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia longifolia	0.625	2(2–2)	0.138	2(1–3)	positive
Boronia anemonifolia	0.125	2(2–2)	0	0(0–0)	positive
Bulbostylis barbata	0.125	1(1–1)	0	0(0–0)	positive
Calandrinia calyptrata	0.125	1(1–1)	0	0(0–0)	positive
Correa reflexa	0.875	2(1–2)	0.123	1(1–2)	positive
Eucalyptus smithii	0.5	2(2–3)	0.043	2(1–3)	positive
Goodenia ovata	0.75	2(1–2)	0.17	2(1–3)	positive
Grevillea victoriae var. *leptoneura*	0.5	2(2–3)	0.01	2(1–3)	positive
Hakea macraeana	0.5	2.5(2–4)	0.035	1(1–2)	positive
Hierochloe rariflora	0.5	2(1–2)	0.18	2(1–3)	positive
Kunzea ambigua	0.625	4(3–6)	0.028	2(1–3)	positive
Lepidosperma laterale	0.875	2(2–2)	0.342	1(1–2)	positive
Pomaderris prunifolia	0.125	1(1–1)	0	0(0–0)	positive
Stypandra glauca	0.75	2(2–2)	0.023	1(1–2)	positive
Lomandra longifolia	0.625	2(2–2)	0.549	2(1–2)	frequent
Eucalyptus sieberi	0.75	1(1–2)	0.28	3(2–4)	frequent
Lepidosperma urophorum	0.75	1.5(1–2)	0.068	1(1–2)	frequent
Platysace lanceolata	0.75	1(1–2)	0.249	2(1–2)	frequent
Eucalyptus elata	0.125	1(1–1)	0.113	3(2–3)	uninformative
Eucalyptus globoidea	0.125	1(1–1)	0.243	3(1–3)	uninformative
Poa meionectes	0.125	1(1–1)	0.541	2(1–3)	negative
Pteridium esculentum	0	0(2–0)	0.58	2(1–3)	negative

Table 52b. Vegetation structure of Map Unit 52. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=3).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	0	-(-)	-(-)
Small tree	66.7	13.5(1.5)	8(3)
Shrub	100	4.0(1.0)	47(14)
Ground cover	100	0.5(0.0)	15(8)

Table 52c. Habitat characteristics of Map Unit 52. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		1134	1126–1166	8
Altitude (m)		749	660–770	8
Slope (degrees)		39	30–46	4
Terrain class				
North	75			3
Intermediate	25			1
South	0			0
Flat	0			0
Parent material				
Devonian granitoids	100			8

Map Unit 53: Montane Heath

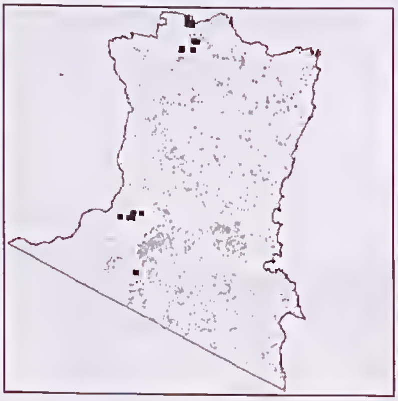
Montane Heath is dominated by a closed shrub canopy of *Allocasuarina nana* exceeding 1 m in height. Other shrubs include *Brachyloma daphnoides, Hakea dactyloides, Baeckea denticulata* and *Kunzea* spp. with several infrequent species. A sparse scattering of eucalypt saplings 10 m tall emerges from the shrub canopy. The groundcover comprises scattered tussocks of grasses and graminoids *Chionochloa pallida, Notodanthonia tenuoir, Austrostipa pubinodis* and *Lomandra glauca.* Montane Heath is restricted to two disjunct occurrences on the edge of the Monaro Tableland: the upper Tuross and Numeralla Rivers area in the north-west; and the Bombala area in the south-west. It occurs on skeletal soils derived from metamorphosed sediments typically above 700 m elevation, although an unusual stand occurs on a granitoid substrate at 560 m elevation in the White Rock River area. The northern heathlands contain a number of species absent from those around Bombala, including *Acacia lucassii, Banksia canei, Dampiera fusca, Dillwynia phylicoides* and *Kunzea* sp. C. While no similar assemblages occur in East Gippsland (Woodgate et al. 1994), patches of montane heathlands extend further north along the escarpment range into Deua National Park. Less than 10% of Montane Heath has been cleared for pine plantations or rough grazing. Further clearing and grazing potentially threatens some of the remainder on private and leasehold land in the Numeralla area. Extreme fire frequencies if sustained, may threaten stands on all tenures, particularly where Montane Heath adjoins pine plantations or grazing lands. Frequent regimes fire may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). The absence of serotinous obligate seeders, such as *Banksia canei, Hakea dactyloides* and *Allocasuarina distyla,* from Montane Heath around Bombala (cf. Wadbilliga) may be a consequence of such regimes in this area during the last 150 years (Banks 1990). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided. Post-fire seedling recruitment in shrub populations may be poor on skeletal soils if drought follows fire. The risk of recruitment failure is greater under frequent fire regimes. Long fire-free intervals also potentially threaten Montane Heath if the length of intervals exceeds the combined longevity of standing plants and seed banks.

Species richness: 17 ± 2 (0.04 ha)
Extant area: 3025 ha
Proportion cleared: 7%
Number of samples: 21

Table 53a. Diagnostic plant species of Map Unit 53.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia lucassii	0.143	1(1–3)	0	0(0–0)	positive
Allocasuarina nana	1	6(6–6.5)	0.005	3(1–3)	positive
Aristida jerichoensis var. *jerichoensis*	0.048	1(1–1)	0	0(0–0)	positive
Baeckea denticulata	0.238	3(2.5–3.5)	0	0(0–0)	positive
Boronia algida	0.143	1(1–3)	0	0(0–0)	positive
Brachyloma daphnoides	0.857	2(1–2)	0.018	1(1–2)	positive
Chionochloa pallida	0.524	2(1–3)	0.099	2(2–3)	positive

Species	**Target frequency**	**Target C/A**	**Residual frequency**	**Residual C/A**	**Fidelity class**
Chloanthes parviflora	0.095	3(2–4)	0	0(0–0)	positive
Dampiera fusca	0.191	1(1–2)	0	0(0–0)	positive
Deyeuxia parviseta var. *boormanii*	0.191	1(1–1)	0	0(0–0)	positive
Dillwynia phylicoides	0.095	3(2–4)	0	0(0–0)	positive
Hakea dactyloides	0.524	2(1–4)	0.007	2(1–2)	positive
Haloragodendron monospermum	0.238	2(1–4.5)	0	0(0–0)	positive
Hibbertia pedunculata	0.333	3(1–4)	0	0(0–0)	positive
Kunzea parvifolia	0.095	2(2–2)	0	0(0–0)	positive
Kunzea sp. C	0.288	3(2–4)	0	0(0–0)	positive
Lomandra glauca	0.619	2(1–3)	0.036	1(1–2)	positive
Patersonia longifolia	0.191	1(1–2.5)	0	0(0–0)	positive
Poa sieberiana var. *cyanophylla*	0.095	1(1–1)	0	0(0–0)	positive
Austrostipa pubinodis	0.571	2(1–3)	0.006	1.5(1–2)	positive
Notodanthonia tenuior	0.524	1(1–1)	0.002	1(1–2)	frequent
Banksia canei	0.191	3(1–5)	0.001	3.5(3–4)	uninformative
Eucalyptus consideniana	0.048	2(2–2)	0.021	2(1–3)	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.048	1(1–1)	0.018	2.5(1–3)	uninformative
Eucalyptus dives	0.143	1(1–4)	0.009	3(2.5–3)	uninformative
Eucalyptus pauciflora	0.191	1(1–2)	0.021	2.5(1–3)	uninformative
Eucalyptus rubida	0.095	1(1–1)	0.006	1(1–3)	uninformative
Eucalyptus sieberi	0.048	3(3–3)	0.286	3(2–4)	uninformative
Gonocarpus tetragynus	0.57	1(1–2)	0.16	2(1–2)	uninformative
Isopogon prostratus	0.238	3(1–3)	0.001	1(1–1)	uninformative
Lepidosperma gunnii	0.524	1(1–2)	0.004	1(1–2)	uninformative
Persoonia chamaepeuce	0.238	1(1–2)	0.008	1(1–2)	uninformative
Schoenus apogon	0.238	2(1.5–3)	0.023	1(1–2)	uninformative
Stylidium graminifolium	0.81	1(1–3)	0.139	1(1–2)	uninformative
Lomandra longifolia	0.333	1(1–1)	0.552	2(1–2)	negative
Poa meionectes	0	0(0–0)	0.547	2(1–3)	negative
Pteridium esculentum	0	0(0–0)	0.585	2(1–3)	negative



Map 53. Distribution of samples of Montane Heath (Map Unit 53) shown by large black squares. Samples of other map units shown as small grey points.

Plate 53. Montane Heath (Map Unit 53) dominated by *Allocasuarina nana* with *Brachyloma daphnoides*, *Notodanthonia tenuior* and scattered emergent *Eucalyptus dalrympleana* on Bald Hill, Bondi Gulf Nature Reserve.

Table 53b. Vegetation structure of Map Unit 53. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=21).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	14.3	10.0(2.9)	15(10)
Small tree	19	1.3(0.1)	3(1)
Shrub	100	1.3(0.2)	86(3)
Ground cover	100	0.3(0.0)	7(2)

Table 53c. Habitat characteristics of Map Unit 53. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°). One extreme value was excluded from the summary statistics for annual rain (1004 mm).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		815	799–814	19
Altitude (m)		950	818–1060	20
Slope (degrees)		10	4–15	21
Terrain class				
North	29			6
Intermediate	38			8
South	5			1
Flat	29			6
Parent material				
Devonian granitoids	5			1
Devonian high quartz sedimentaries	14			3
Low quartz sedimentaries	52			11
Ordovician high quartz sedimentaries	29			6

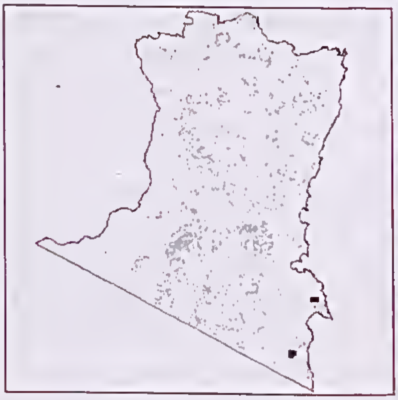
Map Unit 54: Mt Nadgee Heath

Mt Nadgee Heath has an open shrub canopy over 1 m tall, dominated by *Leptospermum trinervium* and *Banksia paludosa* with *Dillwynia glaberrima, Epacris impressa, E. microphylla, Aotus ericoides, Leptospermum continentale, Leucopogon esquamatus, Monotoca scoparia* and *Persoonia levis*. Scattered individuals of *Eucalyptus baxteri* emerge from the shrub stratum. The groundcover is dominated by sedges *Lepidosperma filiforme, L. gladiatum, L. neesii, Lepyrodia scariosa, Gahnia sieberiana* and *Lomandra glauca*, with grasses *Plinthanthesis paradoxa*, herbs *Gonocarpus tetragynus, Dampiera stricta* and *Xanthosia pilosa* and small ferns *Lindsaea linearis*. Swards of *Xanthorrhoea resinifera* occur in damper sites. Mt Nadgee Heath is restricted to rocky Devonian sandstone plateaux around Mt Nadgee and west of Green Cape at elevations up to 450 m and possibly on damper soils than Coastal Lowland Heath (Map Unit 55). No similar assemblages occur outside the Eden region (Austin 1978, Woodgate et al. 1994). Almost all of this restricted unit occurs in reserves. Frequent fire regimes may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 37 ± 3 (0.04 ha)
Extant area: 371 ha
Proportion cleared: 0%
Number of samples: 6

Table 54a. Diagnostic plant species of Map Unit 54.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia terminalis	0.5	2(1–3)	0.118	2(1–3)	positive
Baeckea linifolia	0.167	1(1–1)	0	0(0–0)	positive
Banksia paludosa	0.833	3(2–3)	0.007	2.5(1–3)	positive
Baumea acuta	0.167	2(2–2)	0	0(0–0)	positive
Bossiaea heterophylla	0.5	2(1–2)	0.002	2(1–2)	positive
Conospermum taxifolium	0.333	1.5(1–2)	0	0(0–0)	positive
Dillwynia glaberrima	0.667	2(2–2)	0.006	2(1–3)	positive
Epacris impressa	0.833	2(2–3)	0.194	2(1–2)	positive
Epacris microphylla var. *microphylla*	0.667	3(2–3)	0.01	1.5(1–3)	positive
Eucalyptus baxteri	0.833	3(2–3)	0.005	3(2–4)	positive
Gonocarpus tetragynus	0.667	2(2–2)	0.164	2(1–2)	positive
Lepidosperma filiforme	0.667	2(1–3)	0.014	2(2–3)	positive
Lepidosperma gladiatum	0.667	2.5(1–4)	0.003	1(1–1)	positive
Lepidosperma neesii	0.667	2(2–3)	0.008	2.5(1–3)	positive
Leptospermum trinervium	1	3(2–4)	0.026	2(1–3)	positive
Lindsaea linearis	0.833	2(2–2)	0.029	1(1–2)	positive
Lomandra glauca	0.667	2(2–3)	0.042	1(1–2)	positive
Phebalium diosmeum	0.667	2.5(1–3)	0.002	3(1–3)	positive
Plinthanthesis paradoxa	0.667	2(1–2)	0.002	1(1–2)	positive
Lomandra longifolia	0.5	2(1–3)	0.549	2(1–2)	frequent
Aotus ericoides	0.667	1.5(1–2)	0.024	1(1–2)	frequent
Cassytha glabella	1	1(1–2)	0.019	1(1–2)	frequent
Dampiera stricta	0.833	1(1–2)	0.029	1(1–2)	frequent
Gahnia sieberiana	0.667	1(1–2)	0.074	1(1–3)	frequent



Map 54. Distribution of samples of Mt Nadgee Heath (Map Unit 54) shown by large black squares. Samples of other map units shown as small grey points.

Plate 54. Mt Nadgee Heath (Map Unit 54) dominated by *Allocasuarina nana* with *A. paludosa*, *Leptospermum trinervium*, *Leucopogon esquamatus*, *Lepidosperma concava* and emergent *Eucalyptus baxteri* on Mt Nadgee plateau, Nadgee Nature Reserve.

Leptospermum continentale	0.667	1(1–2)	0.056	1(1–2)	frequent
Lepyrodia scariosa	0.833	1(1–3)	0.002	1(1–3)	frequent
Leucopogon esquamatus	0.667	1.5(1–3)	0.001	2(1–3)	frequent
Monotoca scoparia	0.667	1(1–2)	0.124	2(1–2)	frequent
Persoonia levis	1	1(1–2)	0.023	1(1–1)	frequent
Xanthosia pilosa	0.667	1.5(1–2)	0.057	1(1–2)	frequent
Angophora floribunda	0.167	1(1–1)	0.095	2(1–3)	uninformative
Banksia serrata	0.333	3(3–3)	0.04	1(1–2)	uninformative
Eucalyptus sieberi	0.5	1(1–2)	0.282	3(2–4)	uninformative
Poa meionectes	0	0(1–0)	0.541	2(1–3)	negative
Pteridium esculentum	0.167	2(2–2)	0.578	2(1–3)	negative

Table 54b. Vegetation structure of Map Unit 54. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=6).

Stratum	**Frequency (%)**	**Height (m)**	**Cover (%)**
Tree	83.3	12.2(4.4)	10(2)
Small tree	50	5.3(1.8)	32(2)
Shrub	100	1.2(0.4)	43(7)
Ground cover	100	0.5(0.1)	33(4)

Table 54c. Habitat characteristics of Map Unit 54. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	**Mean**	**Interquartile Range**	**n**
Annual rain (mm)		1013	930–1088	6
Altitude (m)		283	159–389	6
Slope (degrees)		5	3–8	6
Terrain class				
North	0			0
Intermediate	33			2
South	0			0
Flat	67			4
Parent material				
Devonian high quartz sedimentaries	100			6

Map Unit 55: Coastal Lowland Heath

Coastal Lowland Heath has a diverse open shrub canopy up to 1 m tall, dominated by *Allocasuarina paludosa, Banksia paludosa* and *Epacris impressa* with *Acacia suaveolens, Cryptandra ericoides, Hakea decurrens* subsp. *platytaena, Leptospermum continentale, Pimelea linifolia* and *Banksia serrata,* the latter sometimes emerging as small trees with occasional eucalypts 5 m tall. The relatively dense and diverse groundcover is dominated by sedges *Hypolaena fastigiata, Lepidosperma neesii, Leptocarpus tenax* and *Lomandra glauca,* with distinctive herbs including *Burchardia umbellata, Helichrysum obtusifolium, Dampiera stricta, Patersonia glabrata, Xanthosia tridentata* and *X. pusilla,* grasses *Entolasia stricta,* herbs *Gonocarpus tetragynus, Dampiera stricta* and *Xanthosia pilosa* and small ferns *Lindsaea linearis* and *Selaginella uliginosa.* Coastal Lowland Heath is restricted to gentle slopes on coastal deposits of Tertiary alluvium and Recent sands below 100 m elevation south from Pambula. It is distinguished from Mt Nadgee Heath by several shrub and herb species which are apparently unique to the lowland assemblage. Unlike Mt Nadgee Heath, the mainly continuous vegetation cover is not punctuated by outcrops of rock. Although not known further north (Austin 1978), a similar assemblage extends to the south along the East Gippsland coastal plain (Ecological Vegetation Classes 7 and 8, Woodgate et al. 1994). Almost all of this restricted unit occurs within reserves. Frequent regimes fire may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 35 ± 4 (0.04 ha)

Extant area: 1582 ha

Proportion cleared: 2%

Number of samples: 8

Table 55a. Diagnostic plant species of Map Unit 55.

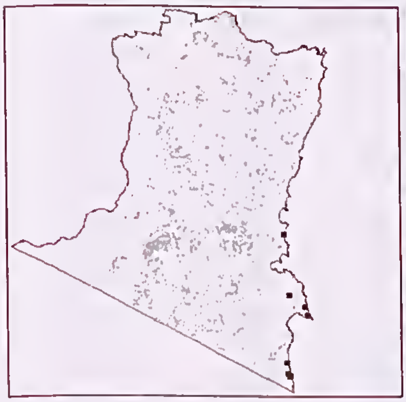
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia suaveolens	0.5	2(1–2)	0.013	1(1–2)	positive
Allocasuarina paludosa	0.75	4(2–5)	0.014	3(1–4)	positive
Almaleea paludosa	0.125	2(2–2)	0	0(0–0)	positive
Banksia paludosa	0.75	3(1–3)	0.006	2(2–3)	positive
Burchardia umbellata	0.625	2(1–2)	0.018	1(1–1)	positive
Cryptandra ericoides	0.5	2(1–3)	0.002	1(1–1)	positive
Epacris impressa	0.875	3(2–3)	0.193	2(1–2)	positive
Euphrasia collina subsp. *collina*	0.25	1.5(1–2)	0	0(0–0)	positive
Hakea decurrens subsp. *platytaena*	0.5	2.5(1–3)	0.022	1(1–2)	positive
Helichrysum obtusifolium	0.375	3(3–3)	0	0(0–0)	positive
Hypolaena fastigiata	0.625	2(2–3)	0.002	1(1–2)	positive
Lepidosperma neesii	0.75	2.5(1–3)	0.007	2(2–3)	positive
Leptocarpus tenax	0.5	3(2–5)	0.005	3(2–3)	positive
Leptospermum continentale	0.875	2(1–3)	0.054	1(1–2)	positive
Lindsaea linearis	0.625	2(1–2)	0.029	1(1–2)	positive
Lomandra glauca	0.875	2(1–2)	0.04	1(1–2)	positive
Mirbelia rubiifolia	0.25	1.5(1–2)	0	0(0–0)	positive
Patersonia glabrata	0.5	2(1–3)	0.065	1(1–2)	positive
Persoonia juniperina	0.125	1(1–1)	0	0(0–0)	positive
Ptilothrix deusta	0.125	2(2–2)	0	0(0–0)	positive
Thysanotus juncifolius	0.125	1(1–1)	0	0(0–0)	positive
Xanthosia pusilla	0.375	2(1–2)	0	0(0–0)	positive
Xanthosia tridentata	0.5	2(2–3)	0.018	1(1–2)	positive
Banksia serrata	0.75	1(1–2)	0.038	1(1–2)	frequent
Cassytha glabella	0.75	1(1–2)	0.019	1(1–2)	frequent
Dampiera stricta	0.625	1(1–2)	0.029	1(1–2)	frequent
Entolasia stricta	0.625	1(1–1)	0.179	2(1–2)	frequent
Pimelea linifolia subsp. *linifolia*	0.75	1(1–2)	0.033	1(1–2)	frequent
Selaginella uliginosa	0.625	1(1–3)	0.008	2(1–3)	frequent
Callitris rhomboidea	0.125	2(2–2)	0.003	1(1–2)	uninformative
Corymbia gummifera	0.125	1(1–1)	0.02	3(2–4)	uninformative
Eucalyptus conspicua	0.125	3(3–3)	0.001	1.5(1–2)	uninformative
Eucalyptus globoidea	0.125	3(3–3)	0.243	3(1–3)	uninformative
Lomandra longifolia	0	0(1–0)	0.552	2(1–2)	negative
Poa meionectes	0	0(1–0)	0.542	2(1–3)	negative
Pteridium esculentum	0	0(1–0)	0.58	2(1–3)	negative

Table 55b. Vegetation structure of Map Unit 55. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=8).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	-	-(-)	-(-)
Small tree	12.5	5.0(-)	15(-)
Shrub	100	0.8(0.2)	59(9)
Ground cover	100	0.4(0.0)	53(10)

Table 55c. Habitat characteristics of Map Unit 55. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		901	884–917	8
Altitude (m)		42	24–65	8
Slope (degrees)		2	1–3	8
Terrain class				
North	0			0
Intermediate	0			0
South	13			1
Flat	88			7
Parent material				
Low quartz sedimentaries	13			1
Tertiary Alluvium	88			7



Map 55. Distribution of samples of Coastal Heath (Map Unit 55) shown by large black squares. Samples of other map units shown as small grey points.

Plate 55. Coastal Heath (Map Unit 55) dominated by *Allocasuarina paludosa, Banksia paludosa* and *Epacris impressa* on Nadgee Moor in Nadgee Nature Reserve.

Map Unit 56: Hinterland Heath

Hinterland Heath has an open shrub canopy dominated by *Allocasuarina paludosa* and *Leptospermum continentale* up to 2 m tall, with *Epacris impressa* and occasionally *Callistemon citrinus.* Scattered emergent trees include *Eucalyptus ignorabilis, E. conspicua* or *E. globoidea.* The relatively dense groundcover is dominated by sedges *Empodisma minus* and *Gahnia radula,* with grasses *Poa meionectes,* herbs *Gonocarpus tetragynus,* *Goodenia paniculata, Hypericum gramineum* and *Patersonia fragilis* and small ferns *Lindsaea linearis*. Hinterland Heath is restricted to small soaks in the southern granitoid hinterland, typically at 150–500 m elevation, but reaching 650 m in the Myanba Creek area. This assemblage lacks many of the shrub and forb species characteristic of the more coastal heath assemblages (Map Units 54 and 55). The most similar assemblage in East Gippsland is a lowland clay heathland entity (within Ecological Vegetation Class 7, Woodgate et al. 1994), which, like Hinterland Heath, is locally restricted but scattered widely in the hinterland. Although almost all of this restricted unit occurs on public land, a small portion is reserved and most occurs within production forest. The principal threats entail small scale clearing, earthworks, erosion, sedimentation and burning associated with logging and roading, even though the paucity of merchantable timber generally precludes direct logging of this assemblage. Frequent fire regimes may reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure to avoid losses of diversity.

Species richness: 29 ± 4 (0.04 ha)

Extant area: 385 ha

Proportion cleared: 0%

Number of samples: 5

Table 56a. Diagnostic plant species of Map Unit 56.

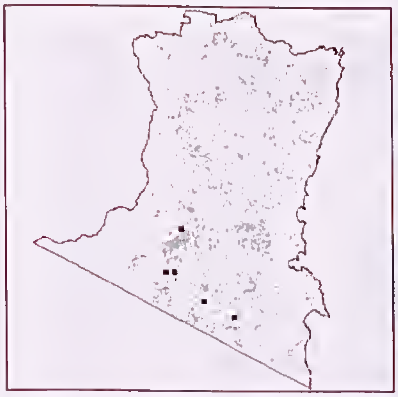
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia brownii	0.2	2(2–2)	0	0(0–0)	positive
Allocasuarina paludosa	1	4(3–5)	0.015	2.5(1–4)	positive
Amphipogon strictus	0.2	2(2–2)	0	0(0–0)	positive
Empodisma minus	0.6	2(1–3)	0.012	2(1–3)	positive
Epacris impressa	0.6	2(1–2)	0.195	2(1–2)	positive
Eucalyptus ignorabilis	0.2	3(3–3)	0	0(0–0)	positive
Gahnia radula	0.6	2(2–3)	0.089	2(1–3)	positive
Gonocarpus tetragynus	0.6	2(1–2)	0.164	2(1–2)	positive
Goodenia humilis	0.2	1(1–1)	0	0(0–0)	positive
Goodenia paniculata	0.4	1(1–1)	0	0(0–0)	positive
Hypericum gramineum	0.6	2(1–2)	0.241	1(1–2)	positive
Leptospermum continentale	1	3(2–3)	0.055	1(1–2)	positive
Patersonia fragilis	0.6	2(2–3)	0.004	1(1–1)	positive
Schoenus lepidosperma subsp. *lepidosperma*	0.2	3(3–3)	0	0(0–0)	positive
Drosera peltata	0.6	1(1–2)	0.008	1(1–1)	frequent
Lindsaea linearis	1	1(1–2)	0.029	1(1–2)	frequent
Poa meionectes	0.6	1(1–3)	0.539	2(1–3)	frequent
Eucalyptus angophoroides	0.2	2(2–2)	0.044	2(1–3)	uninformative
Eucalyptus consideniana	0.2	2(2–2)	0.02	2(1–3)	uninformative
Eucalyptus conspicua	0.2	2(2–2)	0.001	2(1–3)	uninformative
Eucalyptus globoidea	0.4	1(1–1)	0.242	3(1–3)	uninformative
Eucalyptus ovata	0.2	2(2–2)	0.022	3(1–3)	uninformative
Eucalyptus radiata	0.2	1(1–1)	0.076	3(1–3)	uninformative
Eucalyptus sp. aff. *radiata*	0.2	1(1–1)	0.035	3(2–3)	uninformative
Eucalyptus viminalis	0.2	1(1–1)	0.057	3(1–3)	uninformative
Lomandra longifolia	0.2	1(1–1)	0.55	2(1–2)	negative
Pteridium esculentum	0	0(1–0)	0.579	2(1–3)	negative

Table 56b. Vegetation structure of Map Unit 56. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=3).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	0	-(-)	-(-)
Small tree	66.7	5.5(0.5)	4(3)
Shrub	100	3.2(0.4)	63(12)
Ground cover	100	0.6(0.2)	65(16)

Table 56c. Habitat characteristics of Map Unit 56. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		965	958–999	5
Altitude (m)		447	330–560	5
Slope (degrees)		4	4–5	5
Terrain class				
North	40			2
Intermediate	0			0
South	0			0
Flat	60			3
Parent material				
Devonian granitoids	100			5



Map 56. Distribution of samples of Hinterland Heath (Map Unit 56) shown by large black squares. Samples of other map units shown as small grey points.

Plate 56. Hinterland Heath (Map Unit 56) variant dominated by *Callistemon paludosus, Kunzea ericoides, Gahnia sieberiana* and *Allocasuarina nana* on the White Rock River track, Genoa section of the South East Forests National Park.

Map Unit 57: Lowland Swamp

Lowland Swamp has a dense but variable shrub stratum up to 2 m tall, dominated by *Melaleuca squarrosa,* and *Leptospermum continentale* with *Callistemon citrinus, Epacris paludosa* and *Sprengelia incarnata.* Scattered emergent trees of *Eucalyptus consideniana, E. ovata* and *E. conspicua* occur mainly around the edges of swamps. The tall dense groundcover is dominated by sedges *Gahnia sieberiana, G. radula, Lepidosperma limicola, Leptocarpus tenax* and *Lomandra glauca,* with grasses *Tetrarrhena* spp., and small ferns

Selaginella uliginosa. Lowland Swamp is restricted to waterlogged soils on Tertiary alluvium, sandy colluvial granitoid soils and Holocene sands below 100 m elevation in broad open flat gullies in the Nadgee area and lower Wallagaraugh River catchment. A similar assemblage occurs within the riparian scrub complex (Ecological Vegetation Class 17, Woodgate et al. 1994) in similar lowland habitats east of Orbost in East Gippsland. Lowland Swamp includes some stands (e.g. around Nadgee Lake) with affinities to coastal lagoon wetlands (Ecological Vegetation Class 11, Woodgate et al. 1994) in East Gippsland. A relatively small area of Lowland Swamp has been cleared and about two-thirds is represented in reserves. Outside reserves, the principal threat is sedimentation from roading, burning and logging activities within swamp catchments. Frequent fires used in hazard reduction may reduce diversity by interrupting life-cycle processes of woody species. Long fire-free intervals also potentially threaten diversity of small shrubs and forbs which may be excluded by competition from the dense sedge stratum (Keith 1996). Thus to maintain diversity, intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure, and shorter than the combined longevity of standing plants and seed banks.

Species richness: 28 ± 4 (0.04 ha)

Extant area: 1582 ha

Proportion cleared: 2%

Number of samples: 9

Table 57a. Diagnostic plant species of Map Unit 57.

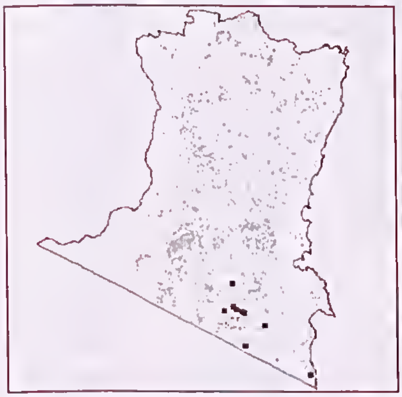
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Baumea teretifolia	0.222	1.5(1–2)	0	0(0–0)	positive
Boronia parviflora	0.333	1(1–1)	0	0(0–0)	positive
Callistemon citrinus	0.667	3(1–3)	0.004	2.5(1–3)	positive
Comesperma retusum	0.111	2(2–2)	0	0(0–0)	positive
Drosera binata	0.111	1(1–1)	0	0(0–0)	positive
Empodisma minus	1	2(2–4)	0.008	2(1–3)	positive
Epacris paludosa	0.556	2(2–3)	0.005	2(1–4)	positive
Gahnia radula	0.556	3(2–4)	0.088	2(1–3)	positive
Gahnia sieberiana	0.556	2(2–3)	0.074	1(1–2)	positive
Lepidosperma limicola	0.556	3(2–4)	0.002	1(1–3)	positive
Leptocarpus tenax	0.778	3(2–3)	0.003	3(2–5)	positive
Leptospermum continentale	0.889	2.5(2–3)	0.053	1(1–2)	positive
Melaleuca squarrosa	1	4(3–4)	0.006	2(2–3)	positive
Sowerbaea juncea	0.111	1(1–1)	0	0(0–0)	positive
Sprengelia incarnata	0.667	2(2–3)	0.001	2(1–3)	positive
Tetrarrhena juncea	0.556	2(2–3)	0.18	2(1–3)	positive
Tetrarrhena turfosa	0.111	2(2–2)	0	0(0–0)	positive
Villarsia exaltata	0.111	1(1–1)	0	0(0–0)	positive
Viminaria juncea	0.111	1(1–1)	0	0(0–0)	positive
Selaginella uliginosa	0.778	1(1–2)	0.007	2(1–3)	frequent
Eucalyptus agglomerata	0.111	1(1–1)	0.109	3(2–3)	uninformative
Eucalyptus angophoroides	0.111	1(1–1)	0.044	2(1–3)	uninformative
Eucalyptus consideniana	0.444	1(1–1)	0.018	3(2–3)	uninformative
Eucalyptus conspicua	0.111	1(1–1)	0.001	2.5(2–3)	uninformative
Eucalyptus ovata	0.222	1(1–1)	0.022	3(1–3)	uninformative
Lomandra longifolia	0.333	1(1–3)	0.55	2(1–2)	negative
Poa meionectes	0.111	1(1–1)	0.541	2(1–3)	negative
Pteridium esculentum	0	0(1–0)	0.58	2(1–3)	negative

Table 57b. Vegetation structure of Map Unit 57. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=9).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	0	-(-)	-(-)
Small tree	55.6	9(0.5)	2(1)
Shrub	100	1.8(0.1)	52(7)
Ground cover	100	1.2(0.1)	91(4)

Table 57c. Habitat characteristics of Map Unit 57. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		910	869–927	9
Altitude (m)		179	70–250	9
Slope (degrees)		3	2–4	9
Terrain class				
North	0			0
Intermediate	22			2
South	0			0
Flat	78			7
Parent material				
Devonian granitoids	67			6
Holocene Riverine Alluvuim	11			1
Tertiary Alluvium	22			2



Map 57. Distribution of samples of Lowland Swamp (Map Unit 57) shown by large black squares. Samples of other map units shown as small grey points.

Plate 57. Lowland Swamp (Map Unit 57) dominated by *Melaleuca squarrosa, Epacris paludosa, Sprengelia incarnata* and sedges on Timbillica Road in Sidlings Swamp Flora Reserve. *Eucalyptus cephalocarpa* occurs on the swamp edge in background.

Map Unit 58: Swamp Forest

Swamp Forest is dominated by *Eucalyptus ovata*, sometimes with *E. viminalis* c. 20 m tall. The shrub stratum is very sparse and includes scattered *Acacia melanoxylon*, sometimes reaching the size of small trees to 8 m tall, with *Olearia glandulosa*. The continuous groundcover is dominated by grasses and graminoids *Carex appressa*, *C. gaudichaudiana, Cyperus lucidus, Eleocharis gracilis, Juncus* spp., *Poa labillardieri* and *Lomandra longifolia*, with interstitial herbs including *Geranium solanderi, Hydrocotyle peduncularis* and *Gratiola peruviana*. Swamp Forest is restricted to deep waterlogged colluvial flats derived from surrounding granitoid slopes. Standing water and peat may occur at limited locations. It occurs within an elevational range of 300–650 m in the southern granitoid hinterland and has some floristic affinities with swampy riparian forest within the riparian scrub complex of East Gippsland (Ecological Vegetation Class 17, Woodgate et al. 1994), most notably in the overstorey, although few of the major understorey species are held in common. About 10% of Swamp Forest has been cleared, the remainder occurring in reserves and State Forest. Outside reserves, the principal threat is sedimentation from roading, burning and logging activities within swamp forest catchments, particularly in the largest stand at Snob Creek. Very intense fires may consume peat at sites where this has developed. Frequent fires used in hazard reduction may reduce diversity by interrupting life-cycle processes of woody species. If very frequent, they may maintain the groundcover in a more open state that is less suitable as shelter for some ground fauna. Thus to maintain diversity, intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure.

Species richness: 30 ± 4 (0.04 ha)

Extant area: 1056 ha

Proportion cleared: 11%

Number of samples: 14

Table 58a. Diagnostic plant species of Map Unit 58.

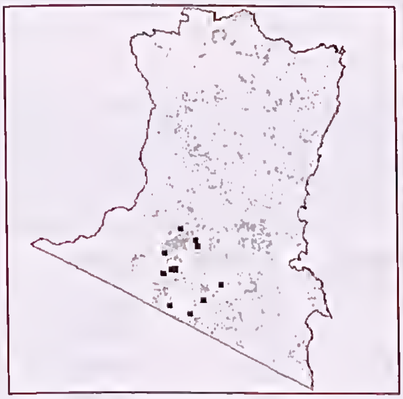
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Carex appressa	0.5	3(1–4)	0.08	1(1–2)	positive
Carex gaudichaudiana	0.571	3(2–5)	0.005	1(1–2)	positive
Cyperus lucidus	0.5	3(1–3)	0.011	2(1–2)	positive
Eleocharis gracilis	0.5	2(1–3)	0.003	2(1–3)	positive
Eucalyptus ovata	0.786	3(2–3)	0.016	2(1–3)	positive
Geranium neglectum	0.571	2(1–2)	0.005	1(1–1)	positive
Hydrocotyle peduncularis	0.643	2(1–2)	0.01	1(1–2)	positive
Juncus homalocaulis	0.071	1(1–1)	0	0(0–0)	positive
Juncus sarophorus	0.357	2(2–3)	0	0(0–0)	positive
Olearia glandulosa	0.143	2(1–3)	0	0(0–0)	positive
Poa labillardieri var. *labillardieri*	0.643	3(3–4)	0.165	1(1–2)	positive
Potamogeton tricarinatus	0.071	1(1–1)	0	0(0–0)	positive
Ranunculus amphitrichus	0.071	1(1–1)	0	0(0–0)	positive
Stellaria angustifolia	0.143	1.5(1–2)	0	0(0–0)	positive
Lomandra longifolia	0.929	3(2–5)	0.545	2(1–2)	frequent
Gratiola peruviana	0.929	1(1–2)	0.015	1.5(1–2)	frequent
Acacia melanoxylon	0.429	1.5(1–2)	0.102	1(1–3)	uninformative
Eucalyptus cypellocarpa	0.071	2(2–2)	0.316	3(2–3)	uninformative
Eucalyptus globoidea	0.143	1(1–1)	0.244	3(1–3)	uninformative
Eucalyptus radiata	0.071	1(1–1)	0.077	3(1–3)	uninformative
Eucalyptus sieberi	0.071	1(1–1)	0.285	3(2–4)	uninformative
Eucalyptus sp. aff. *radiata*	0.071	1(1–1)	0.035	3(2–3)	uninformative
Eucalyptus viminalis	0.286	3(2–4)	0.055	3(1–3)	uninformative
Poa meionectes	0.143	2(2–2)	0.543	2(1–3)	negative
Pteridium esculentum	0.214	1(1–2)	0.58	2(1–3)	negative

Table 58b. Vegetation structure of Map Unit 58. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=8).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	75	20.8(3.6)	28(7)
Small tree	12.5	8.0(-)	4(-)
Shrub	87.5	1.7(0.1)	25(9)
Ground cover	100	0.6(0.1)	81(9)

Table 58c. Habitat characteristics of Map Unit 58. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		982	964–997	14
Altitude (m)		487	399–530	14
Slope (degrees)		2	0–3	14
Terrain class				
North	14			2
Intermediate	0			0
South	0			0
Flat	86			12
Parent material				
Devonian granitoids	93			13
Holocene Riverine Alluvuim	7			1



Map 58. Distribution of samples of Swamp Forest (Map Unit 58) shown by large black squares. Samples of other map units shown as small grey points.

Plate 58. Swamp Forest (Map Unit 58) dominated by *Eucalyptus ovata* and *E. viminalis* with scattered *Acacia melanoxylon* and a continuous groundcover of *Poa labillardieri, Lomandra longifolia* and *Carex* spp. at Sheep Station Creek, Genoa section of South East Forests National Park.

Map Unit 59: Subalpine Bog

Subalpine Bog has an open shrub stratum over 1 m tall dominated by *Baeckea utilis, Epacris paludosa, Hakea microcarpa* and numerous less frequent species in the Myrtaceae and Epacridaceae. Scattered emergent trees including *Eucalyptus pauciflora* and *E. parvula* occur mainly around the edges of swamps. The continuous groundcover is dominated by sedges *Baloskion australe, Lepyrodia anarthria* and *Empodisma minus*, with grasses (e.g. *Agrostis* 'hiemalis'), and a diverse range of herbs *Asperula gunnii, Hydrocotyle peduncularis, Pratia surrepens* and *Gonocarpus micranthus*. Subalpine Bog is restricted to waterlogged broad open flat gullies on alluvium derived from granitoid substrates or metasediments above 800 m elevation on the edge of the Monaro Tableland. Perennial and ephemeral lakes have developed in basalt depressions on the tableland, although most of these are located to the west of the study area. Their flora and vegetation is described by Benson & Jacobs (1994). There is usually development of substantial peat, and standing water is common in winter. A similar assemblage extends further north along the edge of the Monaro Tableland and also south into East Gippsland (Community 1.2, Forbes et al. 1982). Almost 72% of this unit has been cleared or heavily degraded by grazing and over half of the remainder occurs on private land where it is subject to further clearing, continuing degradation by trampling, grazing, nutrification, sedimentation and weed invasion associated with pastoral land uses. The spongy peat soils are especially vulnerable to trampling by stock, which must therefore be excluded if degradation is to be minimised. Bogs in state forest may be affected by sedimentation and burning in adjacent forest, but to a lesser extent than those in pastoral areas. Some stands may also be threatened by peat mining, as has occurred at Killarney Swamp near Bombala. Frequent fires used in hazard reduction and grazing management may reduce diversity by interrupting life-cycle processes of woody species. Intense fires may consume peat, changing habitat structure of the bogs for many years (Keith 1996). Thus intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure, and very intense fires need to be excluded if losses of diversity are to be avoided.

Species richness: 29 ± 4 (0.04 ha)
Extant area: 1897 ha
Proportion cleared: 77%
Number of samples: 9

Table 59a. Diagnostic plant species of Map Unit 59.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Agrostis 'hiemalis'	0.143	1(1–1)	0	0(0–0)	positive
Almaleea subumbellata	0.143	1(1–1)	0	0(0–0)	positive
Asperula gunnii	0.571	2(1–2)	0.018	1(1–1)	positive
Baeckea gunniana	0.143	4(4–4)	0	0(0–0)	positive
Baeckea utilis	0.571	3(2–3)	0.002	1(1–1)	positive
Baloskion australe	0.857	2.5(1–3)	0.001	1(1–1)	positive
Boronia deanei	0.143	4(4–4)	0	0(0–0)	positive
Callistemon pityoides	0.143	3(3–3)	0	0(0–0)	positive
Carex capillacea	0.143	1(1–1)	0	0(0–0)	positive
Celmisia 'pulchella' ms	0.143	2(2–2)	0	0(0–0)	positive
Cotula alpina	0.143	1(1–1)	0	0(0–0)	positive
Notodanthonia eriantha	0.143	1(1–1)	0	0(0–0)	positive
Empodisma minus	0.571	3(2–4)	0.012	2(1–3)	positive
Epacris breviflora	0.286	1(1–1)	0	0(0–0)	positive
Epacris paludosa	0.571	3.5(2–4)	0.005	2(1–3)	positive
Epacris petrophila	0.143	3(3–3)	0	0(0–0)	positive
Festuca hookeriana	0.143	1(1–1)	0	0(0–0)	positive
Hydrocotyle algida	0.143	1(1–1)	0	0(0–0)	positive

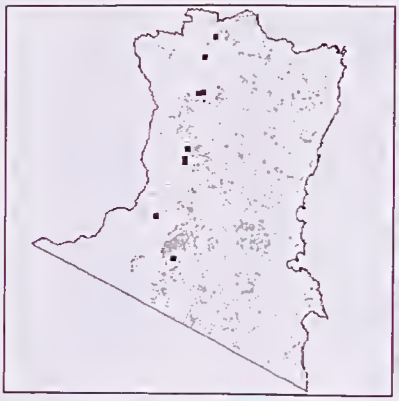
Species	**Target frequency**	**Target C/A**	**Residual frequency**	**Residual C/A**	**Fidelity class**
Hydrocotyle peduncularis	0.571	2(1–3)	0.013	1(1–2)	positive
Isolepis aucklandica	0.143	1(1–1)	0	0(0–0)	positive
Juncus phaeanthus	0.143	1(1–1)	0	0(0–0)	positive
Lepyrodia anarthria	0.571	3(2–3)	0.003	2(1–4)	positive
Nertera granadensis	0.143	1(1–1)	0	0(0–0)	positive
Poa costiniana	0.143	1(1–1)	0	0(0–0)	positive
Pratia surrepens	0.429	1(1–2)	0	0(0–0)	positive
Trisetum spicatum	0.143	1(1–1)	0	0(0–0)	positive
Velleia montana	0.143	1(1–1)	0	0(0–0)	positive
Viola caleyana	0.143	1(1–1)	0	0(0–0)	positive
Gonocarpus micranthus	0.714	1(1–2)	0.01	1(1–1)	frequent
Hakea microcarpa	0.857	1(1–3)	0.001	1(1–1)	frequent
Eucalyptus pauciflora	0.429	1(1–3)	0.021	2(1–3)	uninformative
Eucalyptus rubida	0.143	1(1–1)	0.006	1(1–3)	uninformative
Eucalyptus viminalis	0.143	1(1–1)	0.057	3(1–3)	uninformative
Lomandra longifolia	0	0(1–0)	0.552	2(1–2)	negative
Poa meionectes	0.286	2(2–2)	0.54	2(1–3)	negative
Pteridium esculentum	0	0(1–0)	0.58	2(1–3)	negative

Table 59b. Vegetation structure of Map Unit 59. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=5).

Stratum	**Frequency (%)**	**Height (m)**	**Cover (%)**
Tree	0	-(-)	-(-)
Small tree	40	9.8(2.3)	27(23)
Shrub	100	1.2(0.3)	53(12)
Ground cover	100	0.4(0.1)	69(12)

Table 59c. Habitat characteristics of Map Unit 59. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	**Mean**	**Interquartile Range**	**n**
Annual rain (mm)		923	857–930	9
Altitude (m)		974	938–1036	8
Slope (degrees)		2	1–2	8
Terrain class				
North	13			1
Intermediate	0			0
South	0			0
Flat	88			7
Parent material				
Devonian granitoids	67			6
Devonian high quartz sedimentaries	11			1
Holocene Riverine Alluvuim	11			1
Ordovician high quartz sedimentaries	11			1



Map 59. Distribution of samples of Subalpine Bog (Map Unit 59) shown by large black squares. Samples of other map units shown as small grey points.

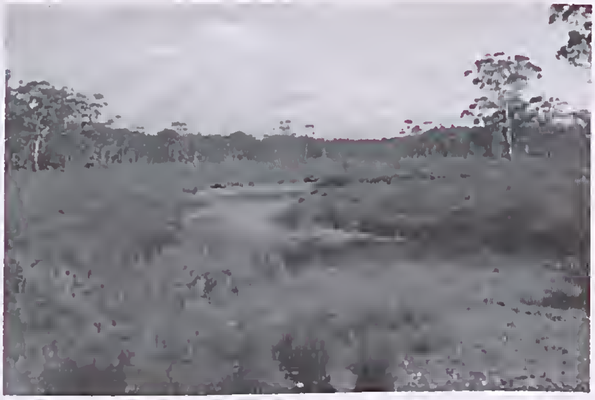


Plate 59. Subalpine Bog (Map Unit 59) dominated by *Baeckea utilis, Hakea microcarpa, Epacris breviflora,* and *Baloskion australe* with *Pratia surrepens* along the drainage line at Nunnock Swamp, Tantawangalo section of South East Forests National Park.

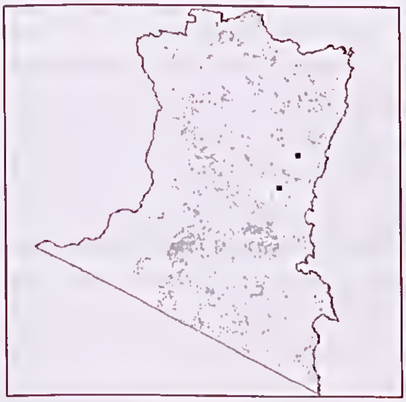
Map Unit 60: Floodplain Wetlands

Floodplain Wetlands is a complex of plant assemblages including reedlands, herbfields, scrubs and swamp forests. Only the latter were sampled quantitatively. Herbaceous wetlands are dominated by *Phragmites australis, Eleocharis sphacelata* and *Typha* spp. and typically have standing water for much of the year. The wooded floodplain swamp forests are dominated by scattered *Eucalyptus ovata,* and may have patchy thickets of *Melaleuca ericifolia* with *Hymenanthera dentata.* The diverse groundcover is patchy and poorly developed beneath dense patches of shrubs. It includes herbs *Callitriche muelleri, Persicaria decipiens, Centella asiatica, Dichondra repens, Geranium solanderi, Lagenifera stipitata, Lobelia alata, Pratia purpurascens, Rumex brownii* and *Senecio minimus,* sedges *Carex* spp., *Eleochaeris acuta, Isolepis habra* and *Juncus planifolius,* and ferns *Adiantum aethiopicum, Blechnum minus* and *Pteris tremula.* Remnants of forested wetlands occur around the margins of the floodplains. Floodplain Wetlands are restricted to the floodplains of the lower Bega and Towamba Rivers on riverine alluvium. Two-thirds of Floodplain Wetlands have been cleared for agriculture and coastal development, while three-quarters of the remainder occur on private land where they are threatened by further clearing, nutrification, weed invasion, trampling and grazing. Much of the remaining area, including that on public land, is wooded wetland. Some herbaceous wetlands persist in varying states of degradation near the town of Bega and at Jellat Jellat. Floodplain vegetation on Australia's south-east coast is generally depleted by clearing and degraded by grazing and weed invasion (e.g. Pressey 1989). In East Gippsland the most similar assemblage is restricted to areas adjacent to coastal lagoons (Ecological Vegetation Type 11, Woodgate et al. 1994).

Species richness: 39 ± 7 (0.04 ha)
Extant area: 2774 ha
Proportion cleared: 68%
Number of samples: 3

Table 60a. Diagnostic plant species of Map Unit 60.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Blechnum minus	0.667	2(1–3)	0.01	1(1–1)	positive
Callitriche muelleri	0.667	2(1–3)	0	0(0–0)	positive
Carex appressa	0.667	2(1–3)	0.083	1(1–2)	positive
Carex brownii	0.333	1(1–1)	0	0(0–0)	positive
Carex longebrachiata	0.667	2.5(2–3)	0.035	1(1–2)	positive
Eleocharis acuta	0.333	2(2–2)	0	0(0–0)	positive
Eucalyptus ovata	0.667	2(1–3)	0.022	3(1–3)	positive
Gahnia clarkei	0.333	1(1–1)	0	0(0–0)	positive
Gratiola pedunculata	0.333	1(1–1)	0	0(0–0)	positive
Hymenanthera dentata	1	2(1–3)	0.068	1(1–2)	positive
Isolepis habra	0.667	2(2–2)	0.01	1(1–2)	positive
Melaleuca ericifolia	1	5(4–6)	0.004	3.5(3–6)	positive
Microlaena stipoides var. *stipoides*	0.667	2.5(2–3)	0.353	2(1–2)	positive
Oplismenus imbecillis	0.667	2(2–2)	0.108	2(1–2)	positive
Persicaria decipiens	0.667	2(2–2)	0.004	1(1–1)	positive
Acaena novae–zelandiae	0.667	1(1–1)	0.131	1(1–2)	frequent
Adiantum aethiopicum	0.667	1.5(1–2)	0.076	1(1–2)	frequent
Cassytha phaeolasia	0.667	1(1–1)	0.044	1(1–2)	frequent
Centella asiatica	0.667	1(1–1)	0.005	1(1–2)	frequent
Coprosma quadrifida	0.667	1(1–1)	0.245	1(1–2)	frequent
Dichondra repens	1	1(1–2)	0.283	2(1–2)	frequent
Entolasia marginata	0.667	1(1–1)	0.045	1(1–2)	frequent
Geranium solanderi	1	1(1–1)	0.091	1(1–2)	frequent
Juncus planifolius	1	1(1–1)	0.014	1(1–1)	frequent
Lagenifera stipitata	1	1(1–2)	0.323	1(1–2)	frequent
Lobelia alata	1	1(1–1)	0.007	1(1–1)	frequent
Pratia purpurascens	1	1(1–2)	0.101	1(1–2)	frequent
Pteris tremula	0.667	1.5(1–2)	0.008	1(1–1)	frequent
Ranunculus plebeius	0.667	1.5(1–2)	0.059	1(1–2)	frequent
Rubus parvifolius	0.667	1(1–1)	0.139	1(1–2)	frequent



Map 60. Distribution of samples of Floodplain Wetland (Map Unit 60) shown by large black squares. Samples of other map units shown as small grey points.

Plate 60. Remnant Floodplain Wetland (Map Unit 60) dominated by *Phragmites australis* with scattered *Melaleuca ericifolia* at Whelans Swamp on Princes Highway south of Eden.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Rumex brownii	1	1(1–1)	0.054	1(1–1)	frequent
Senecio minimus	1	1(1–1)	0.022	1(1–1)	frequent
Viola hederacea subsp. *hederacea*	0.667	1.5(1–2)	0.437	2(1–2)	frequent
Lomandra longifolia	0.333	1(1–1)	0.549	2(1–2)	negative
Poa meionectes	0	0(1–0)	0.54	2(1–3)	negative
Pteridium esculentum	0	0(1–0)	0.578	2(1–3)	negative

Table 60b. Vegetation structure of Map Unit 60. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=3).

Stratum	Frequency	Height (m)	Cover (%)
Tree	67	12.5(2.5)	12(9)
Small tree	100	7.0(0.6)	63(9)
Shrub	100	2.7(0.3)	17(7)
Ground cover	100	0.3(0.1)	23(7)

Table 60c. Habitat characteristics of Map Unit 60. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		814	812–819	3
Altitude (m)		53	15–75	3
Slope (degrees)		1	0–1	3
Terrain class				
North	0			0
Intermediate	0			0
South	0			0
Flat	100			3
Parent material				
Holocene Riverine Alluvuim	100			3

Map Unit 61: Coastal Scrub

Coastal Scrub has a variable shrub stratum up to 3 m tall, dominated by *Acacia sophorae, Banksia integrifolia* and *Leucopogon parviflorus*. These species occur with high frequency, but there are numerous less frequent species apparently exclusive to this assemblage. *Eucalyptus botryoides* is an occasionally emergent small tree. The patchy groundcover includes the prostrate succulent herb *Carpobrotus glaucesceus*, the sedge *Isolepis nodosa* and the herb *Oxalis perennans*. Coastal Scrub is restricted to foredunes and headlands immediately adjacent to the coast. Although assemblages growing in these two habitats are recognisably different in composition and structure, they are presently mapped together. On foredunes, the shrub stratum is shorter and more open and includes a more diverse range of species, several of which are rarely seen on rocky substrates (e.g. *Alyxia buxifolia, Leucopogon parviflorus*). On rocky headlands, tall thickets are dominated by *Melaleuca armillaris* and *Allocasuarina verticellata*, which rarely occur on sand dunes. Some species, such as *Banksia integrifolia*, are ubiquitous in both habitats. Dune Dry Shrub Forest (Map Unit 36) may be adjacent to Coastal Scrub in more sheltered sites on sand dunes. Beach Strand Grassland (Map Unit 62) occurs between Coastal Scrub and the high tide mark. Due to the small size of Beach Strand patches, these two assemblages are mapped together. Similar assemblages extend both north and south of the Eden region. In East Gippsland *Leptospermum laevigatum* becomes a dominant shrub species (Community 20, Forbes et al. 1982; Ecological Vegetation Class 1, Woodgate et al. 1994). One-third of Coastal Scrub has been cleared for coastal development. Although most of the remainder is represented within reserves, some of these reserved areas and some off-reserve sites are threatened by intense recreational usage and development pressures. Causes of continuing degradation include rubbish dumping, small-scale clearing and burning, firewood harvesting, trampling and weed invasion.

Species richness: 17 ± 1 (0.04 ha)
Extant area: 1358 ha (includes a small area of Beach Strand, Map Unit 62)
Proportion cleared: 33%
Number of samples: 41

Table 61a. Diagnostic plant species of Map Unit 61.

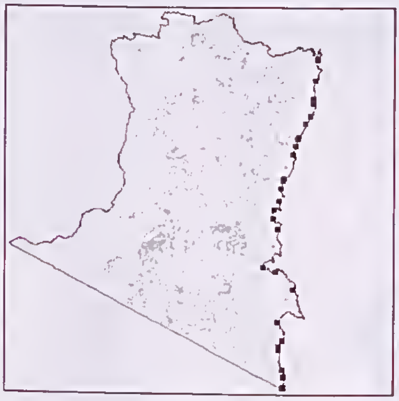
Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Allocasuarina verticillata	0.024	3(3–3)	0	0(0–0)	positive
Alyxia buxifolia	0.122	1(1–2)	0	0(0–0)	positive
Apalochlamys spectabilis	0.024	1(1–1)	0	0(0–0)	positive
Clematis microphylla var. *leptophylla*	0.098	1(1–1)	0	0(0–0)	positive
Correa alba	0.049	2(1–3)	0	0(0–0)	positive
Kunzea capitata	0.024	1(1–1)	0	0(0–0)	positive
Solanum stelligerum	0.024	1(1–1)	0	0(0–0)	positive
Acacia sophorae	0.927	1(1–2)	0.009	1(1–1)	frequent
Banksia integrifolia	0.854	1(1–2)	0.012	1(1–2)	frequent
Carpobrotus glaucescens	0.683	1(1–1)	0.011	1(1–1)	frequent
Isolepis nodosa	0.683	1(1–1)	0.01	1(1–2)	frequent
Leucopogon parviflorus	0.634	1(1–1)	0.002	1(1–1)	frequent
Oxalis perennans	0.683	1(1–1)	0.209	1(1–1)	frequent
Pteridium esculentum	0.561	1(1–1)	0.577	2(1–3)	frequent
Eucalyptus botryoides	0.024	1(1–1)	0.011	2(1–3)	uninformative
Eucalyptus longifolia	0.024	2(2–2)	0.03	3(2–3)	uninformative
Eucalyptus sieberi	0.024	1(1–1)	0.29	3(2–4)	uninformative
Eucalyptus tereticornis	0.024	1(1–1)	0.048	3(1–3)	uninformative
Lomandra longifolia	0.366	1(1–1)	0.554	2(1–2)	negative
Poa meionectes	0.195	1(1–1)	0.549	2(1–3)	negative

Table 61b. Vegetation structure of Map Unit 61. Frequency is the proportion of samples in which strata were present. Height and cover data are means with standard errors in parentheses (n=5).

Stratum	Frequency (%)	Height (m)	Cover (%)
Tree	60	9.7(0.9)	50(26)
Small tree	0	-(-)	-(-)
Shrub	100	2.7(0.5)	51(15)
Ground cover	100	0.7(0.2)	38(18)

Table 61c. Habitat characteristics of Map Unit 61. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
'Annual rain (mm)		813	838–897	41
Altitude (m)		5	5–5	41
Slope (degrees)		9	5–11	5
Terrain class				
North	0			0
Intermediate	80			4
South	0			0
Flat	20			1
Parent material				
Holocene Coastal Sands	98			40
Low quartz sedimentaries	2			1



Map 61. Distribution of samples of Coastal Scrub (Map Unit 61) shown by large black squares. Samples of other map units shown as small grey points.

Plate 61. Coastal Scrub (Map Unit 61) dune variant with *Banksia integrifolia, Acacia sophorae, Westringia fruticosa, Leucopogon parviflorus, Isolepis nodosa* and *Lomandra longifolia* on the foredune at Picnic Point, northern section of Mimosa Rocks National Park. Headland variant dominated by *Allocasuarina verticellata* in background.

Map Unit 62: Beach Strand Grassland

Beach Strand Grassland has a sparse ground stratum dominated by grasses *Spinifex sericeus* and *Festuca littoralis*, with scattered patches of the prostrate succulent herb *Carpobrotus glaucescens*. Beach Strand Grassland is restricted to mobile, unconsolidated calcareous sands on beach strands directly above the high tide mark on the seaward side of Coastal Scrub (Map Unit 61) on beach foredunes. Individual occurrences are generally linear in shape and less than 20 m wide. Coastal Scrub and Beach Strand Grassland (Map Units 61 and 62) were therefore mapped together as a mosaic. Similar assemblages extend both north and south of the Eden region. In East Gippsland similar vegetation is included within the coastal dune scrub complex (Community 20, Forbes et al. 1982; Ecological Vegetation Class 1, Woodgate et al. 1994). Beach Strand Grassland is a very resilient, species-poor assemblage. Its principal species tolerate a wide range of physical disturbances and are widely dispersed by wind and wave action. There are numerous beaches represented in reserves. Beach strands subject to intense recreational usage have grassland with reduced density due to trampling. Some stands include maritime weeds such as *Cakile edentula*.

Species richness: 5 ± 1 (0.04 ha)

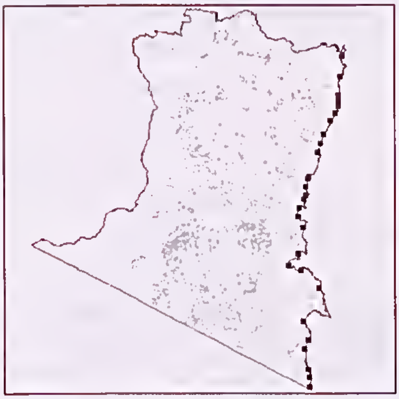
Extant area: 100 ha (approximation only, mapped in mosaic with Map Unit 61)

Proportion cleared: < 10% (approximation only, mapped in mosaic with Map Unit 61)

Number of samples: 30

Table 62a. Diagnostic plant species of Map Unit 62.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Agrostis billardieri	0.067	1(1–1)	0	0(0–0)	positive
Apium prostratum var. *prostratum*	0.067	1(1–1)	0	0(0–0)	positive
Festuca littoralis	0.667	1(1–1)	0.003	1(1–1)	frequent
Spinifex sericeus	1	1(1–2)	0.011	1(1–1)	frequent
Carpobrotus glaucescens	0.533	1(1–1)	0.019	1(1–1)	uninformative
Lomandra longifolia	0.033	1(1–1)	0.56	2(1–2)	negative
Poa meionectes	0	0(3–0)	0.55	2(1–3)	negative
Pteridium esculentum	0	0(2–0)	0.589	2(1–3)	negative



Map 62. Distribution of samples of Beach Strand Grassland (Map Unit 62) shown by large black squares. Samples of other map units shown as small grey points.

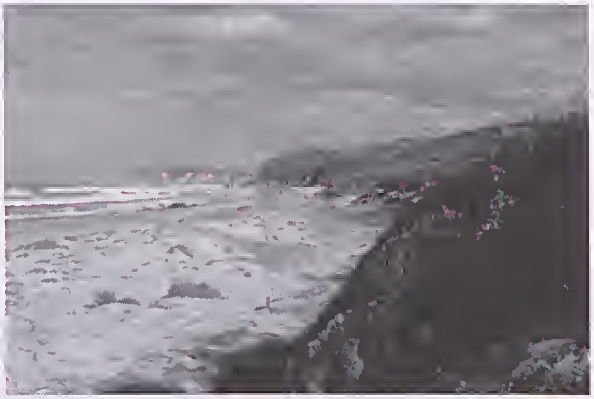


Plate 62. Beach Strand Grassland (Map Unit 62) dominated by *Spinifex sericeus* and *Festuca littoralis* with Coastal Scrub on adjacent foredune of Gillards Beach, southern section of Mimosa Rocks National Park.

Table 62b. Habitat characteristics of Map Unit 62. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		726	836–883	30
Altitude (m)		2	2–2	30
Slope (degrees)		0	0–2	30
Terrain class				
North	0			30
Intermediate	0			30
South	0			30
Flat	100			30
Parent material				
Holocene Coastal Sands	100			30

Map Unit 63: Estuarine Wetland Scrub

Estuarine Wetland Scrub has a dense shrub stratum dominated by *Melaleuca ericifolia* with *Acacia floribunda, Hymenanthera dentata* and *Myoporum acuminatum.* The groundcover includes grasses and graminoids *Carex appressa, Microlaena stipoides, Echinopogon ovatus, Entolasia marginata, Isolepis nodosa, Oplismenus imbecillus* and *Phragmites australis,* and herbs *Acaena nova-zelandiae, Alternanthera denticulata, Commelina cyanea, Geranium potentilloides, Pratia purpurasceus* and *Urtica incisa.* Vines *Stephania japonica* and, in the north, *Parsonsia straminea* climb amongst shrubs and sprawl over the groundcover. Estuarine Wetland Scrub is restricted to semi-saline flats on tributary creeks of coastal lagoons (e.g. Wapengo Lagoon, Merimbula Lake). Over two-thirds of this unit has been cleared and most of the remainder occurs on private land where it is threatened by further clearing and degradation through nutrification, sedimentation and weed invasion associated with adjacent urban and rural land uses. Similar assemblages extend along the coast both north and south of the Eden region. However, these occurrences are restricted. To the north, Estuarine Wetland Scrub is progressively replaced by *Casuarina glauca* fringe forest, a species that reaches its southern limit at Bermagui. In East Gippsland, for example, 'Melaleuca Scrub' is included within the estuarine wetland complex (Ecological Vegetation Class 10, Woodgate et al. 1994), a unit mapped over less than 800 ha.

Species richness: 22 ± 2 (0.04 ha)
Extant area: 956 ha
Proportion cleared: 68%
Number of samples: 4

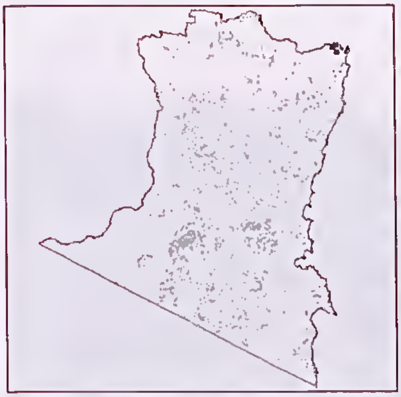
Table 63a. Diagnostic plant species of Map Unit 63.

Species	Target frequency	Target C/A	Residual frequency	Residual C/A	Fidelity class
Acacia floribunda	0.5	2(1–3)	0.016	2(1–3)	positive
Acaena novae-zelandiae	0.5	2(2–2)	0.131	1(1–2)	positive
Alternanthera denticulata	0.75	1(1–2)	0	0(0–0)	positive
Apium prostratum var. *filiforme*	0.25	3(3–3)	0	0(0–0)	positive
Carex appressa	1	2(1–2)	0.082	1(1–2)	positive
Carex longebrachiata	0.5	2(2–2)	0.035	1(1–2)	positive
Casuarina glauca	0.25	1(1–1)	0	0(0–0)	positive
Commelina cyanea	0.75	2(2–2)	0.006	1(1–1)	positive
Echinopogon ovatus	0.5	2(2–2)	0.164	1(1–2)	positive
Entolasia marginata	0.5	2(2–2)	0.045	1(1–2)	positive
Geranium potentilloides	0.5	2(2–2)	0.215	1(1–2)	positive
Hymenanthera dentata	0.5	2.5(2–3)	0.069	1(1–2)	positive
Isolepis nodosa	0.5	2(2–2)	0.027	1(1–1)	positive
Melaleuca ericifolia	0.75	4(3–6)	0.004	4.5(3–6)	positive
Microlaena stipoides var. *stipoides*	0.75	2(2–2)	0.354	2(1–2)	positive
Myoporum acuminatum	0.5	3(3–3)	0.001	1(1–1)	positive
Oplismenus imbecillis	0.75	2(2–3)	0.107	2(1–2)	positive
Parsonsia straminea	1	2(2–3)	0.003	1(1–2)	positive
Phragmites australis	0.5	2(2–2)	0.003	1(1–2)	positive
Pratia purpurascens	0.5	2(2–2)	0.102	1(1–2)	positive
Samolus repens	0.25	2(2–2)	0	0(0–0)	positive

Sarcocornia quinqueflora	0.25	2(2–2)	0	0(0–0)	positive
Senecio linearifolius	0.5	2(2–2)	0.239	1(1–2)	positive
Stephania japonica var. *discolor*	0.75	2(1–2)	0.023	1(1–2)	positive
Suaeda australis	0.25	2(2–2)	0	0(0–0)	positive
Urtica incisa	0.5	2.5(2–3)	0.068	1(1–2)	positive
Viola hederacea subsp. *hederacea*	0.5	2(2–2)	0.437	2(1–2)	positive
Lomandra longifolia	0.5	1.5(1–2)	0.549	2(1–2)	frequent
Eucalyptus bosistoana	0.5	1(1–1)	0.052	2(1–3)	uninformative
Poa meionectes	0	0(3–0)	0.54	2(1–3)	negative
Pteridium esculentum	0	0(2–0)	0.578	2(1–3)	negative

Table 63b. Habitat characteristics of Map Unit 63. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		919	918–919	4
Altitude (m)		15	10–20	4
Slope (degrees)		0	0–0	4
Terrain class				
North	0			0
Intermediate	0			0
South	0			0
Flat	100			4
Parent material				
Holocene Riverine Alluvuim	50			2
Ordovician high quartz sedimentaries	50			2



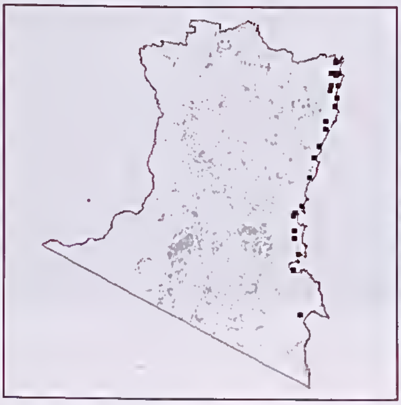
Map 63. Distribution of samples of Estuarine Wetland Scrub (Map Unit 63) shown by large black squares. Samples of other map units shown as small grey points.

Plate 63. Estuarine Wetland Scrub (Map Unit 63) dominated by *Melaleuca ericifolia* with *Phragmites australis* in Bermagui estuary.

Map Unit 64: Saltmarsh

Saltmarsh includes a complex of floristic assemblages juxtaposed in a fine-scale mosaic. Floristic data recorded in 5 × 5 m quadrats were compiled from Clarke (unpubl.). The most ubiquitous dominant species is the succulent herb *Sarcocornia* *quinqueflora*, although several other species may attain local dominance including grasses *Phragmites australis, Sporobolus virginicus, Austrostipa stipoides* and *Zoysia macrantha*, sedges *Baumea juncea* and *Juncus kraussii*, and the herb *Limonium australe*. Other frequent groundcover species include the herbs *Samolus repens, Selliera radicans, Suaeda australis* and *Wilsonia backhousei*. Scattered or clumped shrubs may emerge from the continuous groundcover, including *Sclerostegia arbuscula, Avicennia marina* and *Melaleuca ericifolia*. The latter two species suggest local gradation between Saltmarsh and other estuarine wetland assemblages (Map Unit 66 Grey Mangrove and Map Unit 63 Estuarine Wetland Scrub, respectively). Saltmarsh occurs on the upper limit of the inter-tidal zone on the shores of estuaries and saline lagoons scattered from Wallaga Lake to Wonboyn. The largest stands occur at Merimbula Lake and Bermagui River. Similar but locally restricted assemblages extend north and south of the Eden region. In East Gippsland, for example, Estuarine Wetland Complex (Ecological Vegetation Class 10, Woodgate et al. 1994), a unit including saltmarsh and other estuarine wetlands, is mapped over less than 800 ha. More than one-quarter of the region's Saltmarsh has been cleared for coastal development. Although a small portion of the remainder is protected in conservation reserves, a larger area is protected under NSW State Environmental Planning Policy. Nevertheless, continuing degradation associated with foreshore and catchment development, and intensifying recreational use of the coast pose significant threats to these restricted habitats.

Species richness: 4 ± 0 (0.0025 ha)
Extant area: 295 ha
Proportion cleared: 28%
Number of samples: 141



Map 64. Distribution of samples of Saltmarsh (Map Unit 64) shown by large black squares. Samples of other map units shown as small grey points.

Plate 64. Saltmarsh (Map Unit 64) dominated by *Sclerostegia arbuscula* and *Sarcocornia quinqueflora* with occasional *Avicennia marina* on the southern shore of Merimbula Lake. Estuarine Wetland Scrub appears in the background.

Table 64a. Diagnostic plant species of Map Unit 64.

Species	Target frequency	Target C/A	Fidelity class
Sarcocornia quinqueflora subsp. *quinqueflora*	0.716	3(1–5)	positive
Juncus kraussii	0.369	3(1–4)	positive
Samolus repens	0.319	3(1–4)	positive
Sporobolus virginicus	0.319	3(1–4)	positive
Austrostipa stipoides	0.220	4(3–5)	positive
Avicennia marina	0.184	3(3–4)	positive
Limonium australe	0.170	1(1–4)	positive
Sclerostegia arbuscula	0.163	4(3–4)	positive
Selliera radicans	0.142	3(1–3.75)	positive
Baumea juncea	0.142	3(1.5–5)	positive
Suaeda australis	0.142	1(1–3)	positive
Apium prostratum	0.135	1(1–1)	positive
Melaleuca armillaris	0.106	5(4–5)	positive
Zoysia macrantha	0.106	4(3–5)	positive
Atriplex australasica	0.099	1(1–1)	positive
Gahnia filum	0.092	1(1–3)	positive
Wilsonia backhousei	0.078	4(4–4)	positive
Phragmites australis	0.078	3(3–4)	positive
Disphyma crassifolium subsp. *clavellatum*	0.078	3(1–3)	positive
Myoporum acuminatum	0.064	3(3–4)	positive
Isolepis nodosa	0.064	1(1–1)	positive
Aegiceras corniculatum	0.050	4(3–4)	positive
Melaleuca ericifolia	0.043	4.5(3.75–6)	positive
Triglochin striata	0.035	1(1–3)	positive
Lobelia alata	0.036	1(1–1)	positive
Carpobrotus glaucescens	0.028	1(1–1)	positive
Rhagodia candolleana	0.028	1(1–1)	positive
Tetragonia tetragonoides	0.028	1(1–1)	positive
Juncus usitatus	0.014	1(1–1)	positive
Pseudognaphalium luteoalbum	0.014	1(1–1)	positive
Carex pumila	0.007	1(1–1)	positive
Mimulus repens	0.007	1(1–1)	positive

Map Unit 65: Estuarine Wetland (River Mangrove)

No quantitative data are available for this assemblage. The dominant species is *Aegiceras corniculata* which varies in stature from a shrub to a small tree. There may be a sparse cover of herbaceous species which are associated more commonly with Saltmarsh (Map Unit 64). Estuarine Wetland (River Mangrove) is restricted to the upper tidal zone on mudflats. The principal occurrence is at Merimbula Lake where the dominant species reaches its southern limit. This is a small stand, although *A. corniculata* also occurs as an emergent in Saltmarsh of other estuaries within the region (e.g. Bermagui River). Its distribution continues further north along the New South Wales coast. Mangroves have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. The principal threats entail degradation associated with foreshore and catchment development, and intensifying recreational use of the lake.

Species richness: no data
Extant area: 1 ha
Proportion cleared: 0%
Number of samples: 0

Map Unit 66: Estuarine Wetland (Grey Mangrove)

No quantitative data are available for this unit. The dominant species is *Avicennia marina* which varies in stature from a shrub to a small tree and usually occurs in pure stands. Occasional co-occurring species include *Aegiceras corniculata* and some herbaceous species which are associated more commonly with Saltmarsh (Map Unit 64). Estuarine Wetland (Grey Mangrove) is restricted to the lower tidal zone on mudflats. It is more widespread and in more frequently inundated habitat than River Mangrove (Map Unit 65). Small stands are scattered from Wonboyn to Wallaga Lake and extend well north along the coast. Mangroves have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. Most stands of Grey Mangrove adjoin freehold or crown land, although many of these are protected from direct disturbance under NSW state environmental planning policy. As for River Mangrove (Map Unit 65), the principal threats entail degradation associated with foreshore and catchment development, and intensifying recreational use of coastal lakes and estuaries.

Species richness: no data
Extant area: 101 ha
Proportion cleared: 19%
Number of samples: 0

Plate 65. Grey Mangrove (Map Unit 66) with *Avicennia marina* adjacent to open water on the southern shore of Merimbula Lake.

Map Unit 67: Seagrass Meadows (*Halophila*)

No quantitative data are available for this unit. The dominant species is *Halophila ovalis* which may co-occur with other seagrass species (Map Units 68–70). Seagrass Meadows (*Halophila*) are restricted to soft substrates in the sub-tidal zone of coastal estuaries. The principal stands are in Wallagoot and Cuttagee Lakes, with a smaller stand in Wallaga Lake. Similar assemblages are likely to occur in estuaries further north and south. More work is required to establish its relationship to other seagrass assemblages. Sea grass meadows have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. Potential threats include degradation caused by development or pasture improvement in estuary catchments, although the relevant catchments are partially protected in conservation reserves.

Species richness: no data
Extant area: 108 ha
Proportion cleared: -
Number of samples: 0

Map Unit 68: Seagrass Meadows (*Posidonia*)

No quantitative data are available for this unit. The dominant species is *Posidonia australis* which may co-occur with other seagrass species (Map Units 67, 69 & 70). Seagrass Meadows (*Posidonia*) are restricted to soft substrates in the sub-tidal zone of coastal estuaries. The principal stands are in Merimbula Lake and the Bermagui River estuary, although its distribution extends well north and south of the study area. More work is required to establish its relationship to other seagrass assemblages in the region. Sea grass meadows have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. Potential threats include degradation caused by development or pasture improvement in estuary catchments.

Species richness: no data
Extant area: 130 ha
Proportion cleared: -
Number of samples: 0

Map Unit 69: Seagrass Meadows (*Ruppia*)

No quantitative data are available for this unit. The dominant species are *Ruppia polycarpa* and *R. megacarpa* which may co-occur with other seagrass species (Map Units 67, 68 & 70). Seagrass Meadows (*Ruppia*) are restricted to soft substrates in the sub-tidal zone of coastal estuaries. Scattered occurrences include Curalo Lagoon near Eden, Middle Lagoon, Baragoot Lake and Wallaga Lake. Similar assemblages are likely to occur in estuaries further north and south. More work is required to establish its relationship to other seagrass assemblages in the region. Sea grass meadows have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. Potential threats include degradation caused by development or pasture improvement in estuary catchments, although the some of the catchments are partially protected in conservation reserves.

Species richness: no data
Extant area: 56 ha
Proportion cleared: -
Number of samples: 0

Map Unit 70: Seagrass Meadows (*Zostera*)

No quantitative data are available for this unit. The dominant species is *Zostera capricorni* which may co-occur with other seagrass species (Map Units 67–69). Seagrass Meadows (*Zostera*) are restricted to soft substrates in the sub-tidal zone of coastal estuaries. Further work is required to establish its relationship to other seagrass assemblages in the region. This is the most widespread seagrass assemblage in the Eden region, with occurrences in most coastal lagoon and estuaries between Wonboyn and Wallaga Lakes. Similar assemblages are likely to occur in estuaries further north and south. Sea grass meadows have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. Potential threats include degradation caused by development or pasture improvement in estuary catchments, although some of these catchments are partially protected in conservation reserves.

Species richness: no data
Extant area: 423 ha
Proportion cleared: -
Number of samples: 0

Plate 66. An example of Sea Grass Meadows dominated by *Zostera capricorni* (Map Unit 70) in the shallows of Corunna Lake.

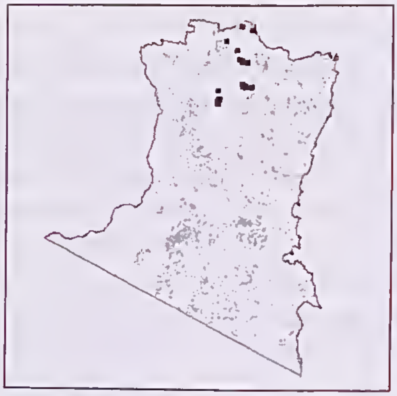
Map Unit W1: Wadbilliga Dry Shrub Forest

Wadbilliga Dry Shrub Forest is dominated by a variable mixture of ash and stringybark eucalypts including *E. fraxinoides, E. globoidea* and *E. agglomerata* as the most frequent species. A prominent stratum of sclerophyllous shrubs includes *Acacia obtusifolia, Leucopogon lanceolatus, Podolobium ilicifolium, Persoonia linearis* and *Platysace lanceolata.* The sparse groundcover includes *Dianella caerulea* and *Lomandra longifolia.* Wadbilliga Dry Shrub Forest occupies narrow ridges and upper slopes on metasediments at 400–1000 m elevation. It is likely to extend north of the Eden region in similar dissected terrain. Its rugged and inaccessible habitat and its distribution almost entirely within Wadbilliga National Park have protected this assemblage from past clearing activities. Although not currently threatened, increases in fire frequency would very likely result in losses of species diversity if an increase in ignitions occurred in future. Frequent fire regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 18 ± 1 (0.05 ha)
Extant area: 27 336 ha
Proportion cleared: 0%
Number of samples: 28

Table 65a. Diagnostic plant species of Map Unit W1.

Species	Target frequency	Residual frequency	Fidelity class
Acacia obtusifolia	0.6	0.054	positive
Allocasuarina distyla	0.025	0	positive
Dianella caerulea	0.65	0.257	positive
Eucalyptus blaxlandii	0.025	0	positive
Leucopogon lanceolatus var. *lanceolatus*	0.8	0.062	positive
Podolobium ilicifolium	0.575	0.08	positive
Persoonia linearis	0.85	0.270	positive
Platysace lanceolata	0.75	0.264	positive
Lomandra longifolia	0.65	0.537	frequent
Eucalyptus agglomerata	0.25	0.090	uninformative
Eucalyptus consideniana	0.05	0.011	uninformative
Eucalyptus cypellocarpa	0.2	0.307	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.05	0.040	uninformative
Eucalyptus elata	0.15	0.114	uninformative
Eucalyptus fastigata	0.1	0.167	uninformative
Eucalyptus fraxinoides	0.35	0.047	uninformative
Eucalyptus globoidea	0.3	0.228	uninformative
Eucalyptus muelleriana	0.1	0.117	uninformative
Eucalyptus radiata	0.125	0.073	uninformative
Eucalyptus smithii	0.075	0.058	uninformative
Poa meionectes	0.275	0.590	negative
Pteridium esculentum	0.45	0.558	negative



Map 65. Distribution of samples of Wadbilliga Dry Shrub Forest (Map Unit W1) shown by large black squares. Samples of other map units shown as small grey points.

Plate 67. Wadbilliga Dry Shrub Forest (Map Unit W1) dominated by *Eucalyptus sieberi* with *Podolobium ilicifolium*, *Xanthorrhoea concava* and *Lomandra confertifolia* ssp. *similis* near the eastern end of the Razorback Trail, Wadbilliga National Park.

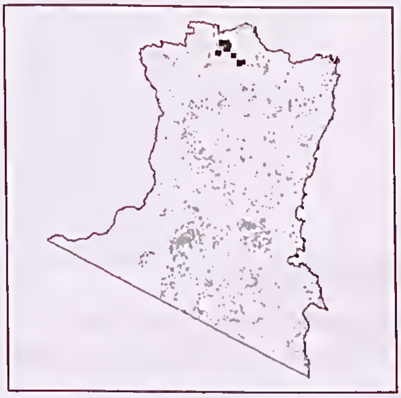
Table 65b. Habitat characteristics of Map Unit W1. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		930	911–949	28
Altitude (m)		686	553–810	28
Slope (degrees)		22	11–35	28
Terrain class				
North	36			10
Intermediate	25			7
South	21			6
Flat	18			5
Parent material				
Devonian granitoids	7			2
Devonian high quartz sedimentaries	75			21
Low quartz sedimentaries	14			4
Ordovician high quartz sedimentaries	4			1

Map Unit W2: Wadbilliga Range Shrub Forest

Wadbilliga Range Shrub Forest is dominated by *Eucalyptus fraxinoides* with *E. fastigata* or *E. pauciflora*. A prominent shrub stratum includes *Acrotriche serrulata, Banksia canei, Choretrum candollei, Oxylobium ellipticum, Persoonia silvatica* and *Platysace lanceolata*. The groundcover includes herbs *Dianella tasmanica, Stylidium graminifolium* and matrush *Lomandra longifolia*. This assemblage has a more uniform tree stratum and less sclerophyllous understorey than Wadbilliga Dry Shrub Forest (W1) and differs from Mountain Intermediate Shrub Forest (Map Unit 41) in the composition of sub-dominant tree species, as well as major understorey species. Wadbilliga Range Shrub Forest occupies metamorphosed sandstone at 1000–1300 m elevation on steep sheltered upper slopes. It thus occurs at higher elevation than Map Units W1 and 41, and is found exclusively around the Wadbilliga Mountain plateau and associated ridges in Wadbilliga National Park. Similar assemblages may extend further north in rough terrain (Austin 1978, CSIRO 1996), while to the south it grades into Mountain Intermediate Shrub Forest (Map Unit 41) around Brown Mountain. Although not currently threatened, increases in fire frequency would very likely result in losses of species diversity if an increase in ignitions occurred in future. Frequent fire regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 20 ± 1 (0.05 ha)
Extant area: 933 ha
Proportion cleared: 0%
Number of samples: 15



Map 66. Distribution of samples of Wadbilliga Range Shrub Forest (Map Unit W2) shown by large black squares. Samples of other map units shown as small grey points.

Plate 68. Wadbilliga Range Shrub Forest (Map Unit W2) dominated by *Eucalyptus fraxinoides* with *Persoonia silvatica, Leucopogon gelidus, Oxylobium arborescens* and *Choretrum candollei* on the Razorback Trail, Wadbilliga National Park.

Table 66a. Diagnostic plant species of Map Unit W2.

Species	Target frequency	Residual frequency	Fidelity class
Acrotriche serrulata	0.875	0.048	positive
Banksia canei	0.625	0.017	positive
Choretrum candollei	0.563	0.014	positive
Deyeuxia rodwayi	0.063	0	positive
Dianella tasmanica	0.625	0.247	positive
Eucalyptus fraxinoides	0.813	0.046	positive
Oxylobium ellipticum	0.938	0.013	positive
Persoonia silvatica	0.563	0.061	positive
Platysace lanceolata	0.813	0.272	positive
Stylidium graminifolium	0.688	0.143	positive
Lomandra longifolia	0.625	0.540	frequent
Eucalyptus dalrympleana subsp. *dalrympleana*	0.125	0.038	uninformative
Eucalyptus fastigata	0.313	0.163	uninformative

Species	Target frequency	Residual frequency	Fidelity class
Eucalyptus latiuscula	0.125	0.002	uninformative
Eucalyptus nitens	0.25	0.012	uninformative
Eucalyptus pauciflora	0.313	0.019	uninformative
Eucalyptus sieberi	0.125	0.286	uninformative
Poa meionectes	0.313	0.584	negative
Pteridium esculentum	0.438	0.556	negative

Table 66b. Habitat characteristics of Map Unit W2. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		973	939–1004	15
Altitude (m)		1173	1133–1225	14
Slope (degrees)		16	6–26	14
Terrain class				
North	7			1
Intermediate	36			5
South	36			5
Flat	21			3
Parent material				
Devonian high quartz sedimentaries	93			14
Low quartz sedimentaries	7			1

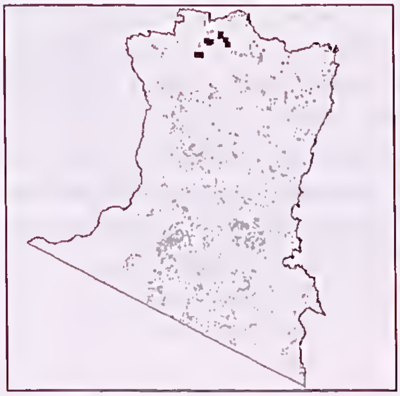
Map Unit W3: Wadbilliga Heath Forest

Wadbilliga Heath Forest is dominated by *Eucalyptus kybeanensis* with *E. pauciflora* or *E. dalrympleana*. A prominent shrub stratum includes *Banksia canei, Dillwynia sericea, Hibbertia pedunculata, Kunzea* sp. C, *Oxylobium ellipticum* and *Platysace lanceolata*. The groundcover includes *Gahnia sieberiana* and *Stylidium graminifolium*. Wadbilliga Heath Forest occupies dry sites on a metamorphosed sandstone plateau at 1100–1350 m elevation. It occupies more exposed sites than Northern Ash Dry Forest (Map Unit W2) and less exposed sites than Montane Heath (Map Unit 53). This assemblage is distinguished from the latter by the presence of a tree stratum and a more open shrub stratum. It is found almost exclusively on the Wadbilliga Mountain plateau and associated ridges to the south-west within Wadbilliga National Park. Although not currently threatened, extremes in fire frequency, if sustained, would very likely result in losses of species diversity. The most western stands may have been exposed to higher frequencies prior to park dedication (unpubl. data). Frequent fire regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 20 ± 2 (0.05 ha)
Extant area: 1683 ha
Proportion cleared: 0%
Number of samples: 13

Table 67a. Diagnostic plant species of Map Unit W3.

Species	Target frequency	Residual frequency	Fidelity class
Allocasuarina nana	0.667	0.010	positive
Boronia algida	0.533	0	positive
Dillwynia sericea	0.667	0.007	positive
Epacris robusta	0.267	0	positive
Eucalyptus kybeanensis	0.6	0	positive
Eucalyptus paliformis	0.067	0	positive
Gahnia sieberiana	0.8	0.082	positive
Hakea dactyloides	0.733	0.014	positive
Hibbertia pedunculata	0.533	0.002	positive
Kunzea sp. C	0.6	0.002	positive
Leptospermum lanigerum	0.733	0.013	positive
Monotoca scoparia	0.533	0.134	positive
Platysace lanceolata	0.6	0.275	positive
Schoenus ericetorum	0.067	0	positive
Stylidium graminifolium	0.533	0.145	positive
Eucalyptus dalrympleana subsp. *dalrympleana*	0.4	0.035	uninformative
Eucalyptus fraxinoides	0.067	0.056	uninformative
Eucalyptus latiuscula	0.133	0.002	uninformative
Eucalyptus pauciflora	0.333	0.019	uninformative
Eucalytpus radiata	0.133	0.074	uninformative
Eucalytpus sieberi	0.067	0.286	uninformative
Lomandra longifolia	0.333	0.543	negative
Poa meionectes	0.133	0.586	negative
Pteridium esculentum	0	0.561	negative



Map 67. Distribution of samples of Wadbilliga Heath Forest (Map Unit W3) shown by large black squares. Samples of other map units shown as small grey points.

Plate 69. Wadbilliga Heath Forest (Map Unit W3) with *Eucalyptus pauciflora, E. latiuscula, Banksia canei, Kunzea* sp. C and *Leptospermum myrtifolium* south of Wadbilliga trig on the Razorback Trail, Wadbilliga National Park.

Table 67b. Habitat characteristics of Map Unit W3. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		956	888–1008	13
Altitude (m)		1197	1120–1260	13
Slope (degrees)		12	3–19	13
Terrain class				
North	15			2
Intermediate	15			2
South	38			5
Flat	31			4
Parent material				
Devonian high quartz sedimentaries	85			11
Low quartz sedimentaries	15			2

Map Unit W4: Kydra Flats Grass Forest

Kydra Flats Grass Forest has a variable tree stratum most frequently dominated by *Eucalyptus viminalis,* and *E. dalrympleana* with *E. radiata* or *E. fraxinoides.* An open shrub stratum includes *Leucopogon lanceolatus, Lomatia myricoides* and *Persoonia silvatica.* The prominent groundcover includes grasses and graminoids *Poa clivicola, P. meionectes* and *Lomandra longifolia,* herbs *Dianella tasmanica* and *Senecio glomeratus,* the vine *Clematis aristata* and bracken *Pteridium esculentum.* Kydra Flats Grass Forest occupies flats and sheltered slopes on metasediments at 1000–1200 m elevation. It has a more variable tree stratum and more prominent shrub stratum than other assemblages on flats at lower elevation on different substrates. It is restricted to transitional terrain between the Wadbilliga range and the Monaro plain in the upper Tuross and upper Brogo River catchments and may extend further north along the eastern edge of the Monaro. About 10% of this unit has been cleared, while much of the remainder is within Wadbilliga National Park. Stands that remain outside the reserve are exposed to moderate grazing pressure. The rural interface may be subject to high fire frequencies in certain locations. Frequent fire regimes reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

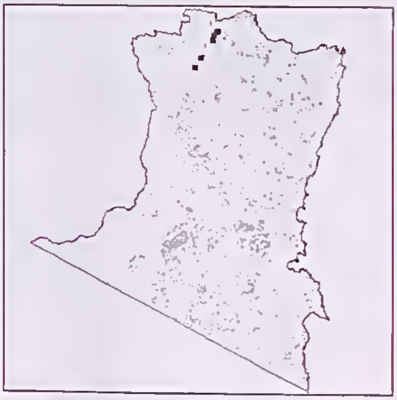
Species richness: 24 ± 2 (0.05 ha)
Extant area: 3098 ha
Proportion cleared: 9%
Number of samples: 6

Table 68a. Diagnostic plant species of Map Unit W4.

Species	Target frequency	Residual frequency	Fidelity class
Clematis aristata	0.643	0.337	positive
Dianella tasmanica	0.643	0.247	positive
Leucopogon lanceolatus var. *lanceolatus*	0.643	0.079	positive
Lomatia fraseri	0.5	0.034	positive
Persoonia silvatica	0.5	0.062	positive
Poa clivicola	0.571	0.0048	positive
Podolepis robusta	0.071	0	positive
Senecio glomeratus	0.714	0.020	positive
Lomandra longifolia	0.786	0.538	frequent
Poa meionectes	0.714	0.579	frequent
Pteridium esculentum	0.857	0.551	frequent
Elaeocarpus holopetalus	0.143	0.021	uninformative
Eucalyptus cypellocarpa	0.143	0.305	uninformative
Eucalyptus dalrympleana subsp. *dalrympleana*	0.357	0.036	uninformative
Eucalyptus fraxinoides	0.286	0.054	uninformative
Eucalyptus muelleriana	0.071	0.117	uninformative
Eucalyptus radiata	0.286	0.073	uninformative
Eucalyptus sieberi	0.071	0.286	uninformative
Eucalyptus viminalis	0.357	0.054	uninformative

Table 68b. Habitat characteristics of Map Unit W4. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		848	827–858	6
Altitude (m)		1083	1053–1108	6
Slope (degrees)		7	4–10	6
Terrain class				
North	17			1
Intermediate	33			2
South	17			1
Flat	33			2
Parent material				
Devonian granitoids	17			1
Devonian high quartz sedimentaries	33			2
Low quartz sedimentaries	50			3



Map 68. Distribution of samples of Kydra Flats Grass Forest (Map Unit W4) shown by large black squares. Samples of other map units shown as small grey points.

Plate 70. Kydra Flats Grass Forest (Map Unit W4) dominated by *Eucalyptus dalrympleana* and *E. fastigata* with *E. radiata, Acacia dealbata, Lomatia fraseri, Poa meionectes* and *Dianella tasmanica* near the intersection of Kydra and Razorback trails, Wadbilliga National Park.

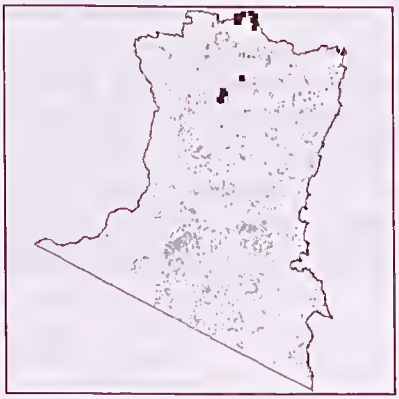
Map Unit W5: Wadbilliga Gorge Dry Forest

Wadbilliga Gorge Dry Forest is dominated by *Angophora floribunda* and *Eucalyptus globoidea* with a wide range of minor eucalypt species. *Allocasuarina littoralis* forms a prominent small tree stratum. The shrub stratum is sclerophyllous and highly variable in composition, *Persoonia linearis* being the most frequent species. The groundcover includes graminoids *Lomandra longifolia,* herbs *Oxalis perennans,* the vine *Glycine clandestina* and bracken *Pteridium esculentum*. Wadbilliga Gorge Dry Forest occupies steep to moderate dry slopes on metasediments and granitoid substrates at 200–500 m elevation. It differs from other assemblages in the dissected northern terrain in tree composition and the presence of a subcanopy, albeit patchy and probably extends further north in similar habitat. It is restricted to the gorges of Tuross and Brogo Rivers and their tributaries, principally within Wadbilliga National Park. Although not presently a serious threat, frequent fire regimes if they occurred would reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 22 ± 1 (0.05 ha)
Extant area: 7423 ha
Proportion cleared: 6%
Number of samples: 22

Table 69a. Diagnostic plant species of Map Unit W5.

Species	Target frequency	Residual frequency	Fidelity class
Allocasuarina littoralis	0.5	0.158	positive
Angophora floribunda	0.667	0.102	positive
Callitris endlicheri	0.095	0	positive
Cryptandra spinescens	0.024	0	positive
Eucalyptus globoidea	0.595	0.218	positive
Glycine clandestina	0.5	0.282	positive
Hibbertia riparia	0.048	0	positive
Mentha satureioides	0.119	0	positive
Oxalis perennans	0.571	0.204	positive
Persoonia linearis	0.810	0.271	positive
Pterostylis obtusa	0.0238	0	positive
Lomandra longifolia	0.786	0.532	frequent
Pteridium esculentum	0.548	0.554	frequent
Eucalyptus agglomerata	0.286	0.088	uninformative
Eucalyptus angophoroides	0.333	0.034	uninformative
Eucalyptus baueriana	0.024	0.016	uninformative
Eucalyptus bosistoana	0.024	0.033	uninformative
Eucalyptus consideniana	0.071	0.011	uninformative
Eucalyptus cypellocarpa	0.238	0.306	uninformative
Eucalyptus dives	0.048	0.011	uninformative
Eucalyptus elata	0.238	0.110	uninformative
Eucalyptus fastigata	0.071	0.168	uninformative
Eucalyptus maidenii	0.167	0.052	uninformative
Eucalyptus mannifera	0.048	0.001	uninformative
Eucalyptus muelleriana	0.191	0.114	uninformative
Eucalyptus radiata	0.048	0.076	uninformative
Eucalyptus sieberi	0.214	0.286	uninformative
Eucalyptus smithii	0.119	0.056	uninformative
Eucalyptus stenostoma	0.024	0.010	uninformative
Eucalyptus tereticornis	0.024	0.051	uninformative
Eucalyptus viminalis	0.071	0.056	uninformative
Poa meionectes	0.476	0.584	negative



Map 69. Distribution of samples of Wadbilliga Gorge Dry Forest (Map Unit W5) shown by large black squares. Samples of other map units shown as small grey points.

Plate 71 Wadbilliga Gorge Dry Forest (Map Unit W5) dominated by *Eucalyptus agglomerata* and *E. consideniana* with *Allocasuarina littoralis, Persoonia linearis* and *Dodonaea triquetra* on the lower slopes of the Wadbilliga River gorge, Wadbilliga trail, Wadbilliga National Park.

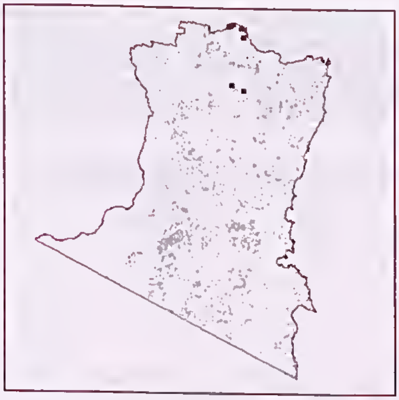
Table 69b. Habitat characteristics of Map Unit W5. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		948	905–990	22
Altitude (m)		372	243–478	22
Slope (degrees)		20	11–26	22
Terrain class				
North	45			10
Intermediate	45			10
South	9			2
Flat	0			0
Parent material				
Devonian granitoids	36			8
Devonian high quartz sedimentaries	18			4
Low quartz sedimentaries	18			4
Ordovician high quartz sedimentaries	27			6

Map Unit W6: Wadbilliga River Valley Forest

Wadbilliga River Valley Forest is dominated by *Eucalyptus elata* and *Angophora floribunda* occasionally with *E. viminalis* and a narrow band of *Casuarina cunninghamiana* along river banks. A prominent non-sclerophyllous shrub stratum is dominated by *Bursaria lasiophylla, Hymenanthera dentata, Lomatia myricoides* and *Phyllanthus gasstroemii.* The semi-continuous groundcover includes forbs *Dichondra repens, Oxalis perennans, Pratia purpurascens* and *Solanum pungetium,* ferns *Pellaea falcata* and *Pteridium esculentum,* grasses and graminoids *Entolasia marginata* and *Lomandra longifolia,* and the scrambling shrub *Rubus parvifolius.* Wadbilliga River Valley Forest occupies sheltered slopes in the lower gorges of the Tuross and Wadbilliga Rivers below 300 m elevation on metasediments and granitoid parent materials. Its combination of tree and shrub species distinguish it from other assemblages in the dissected northern terrain. Similar assemblages may occur north of the Eden region in gorge terrain, although occurrences are likely to be restricted. Some areas of Wadbilliga River Valley Forest may have been subject to rough grazing prior to dedication of Wadbilliga National Park, but past clearing has been negligible. Although not presently a serious threat, frequent fire regimes if they occurred would reduce diversity by interrupting life-cycle processes of woody species (Keith 1996). Intervals between planned and unplanned fires need to be long enough to allow replenishment of seed banks and restoration of habitat structure if losses of diversity are to be avoided.

Species richness: 33 ± 3 (0.05 ha)
Extant area: 1947 ha
Proportion cleared: 0%
Number of samples: 7



Map 70. Distribution of samples of Wadbilliga River Valley Forest (Map Unit W6) shown by large black squares. Samples of other map units shown as small grey points.

Plate 72 Wadbilliga River Valley Forest (Map Unit W6) dominated by *Eucalyptus elata* with *Casuarina cunninghamiana, Acacia floribunda, Cassinia trinerva* and *Hymenathera dentata* festooned with *Cissus hypoglauca* and *Smilax australis* along the Wadbilliga River flats and adjacent slopes, Wadbilliga National Park.

Table 70a. Diagnostic plant species of Map Unit W6.

Species	Target frequency	Residual frequency	Fidelity class
Angophora floribunda	0.539	0.117	positive
Bursaria lasiophylla	0.539	0.018	positive
Casuarina cunninghamiana	0.539	0.004	positive
Dichondra repens	0.769	0.248	positive
Entolasia marginata	0.692	0.060	positive
Eucalyptus elata	0.692	0.109	positive
Hymenanthera dentata	0.539	0.069	positive
Lomatia myricoides	0.615	0.077	positive
Oxalis perennans	0.692	0.212	positive
Pellaea falcata var. *falcata*	0.692	0.095	positive
Phyllanthus gasstroemii	0.615	0.011	positive
Pratia purpurascens	0.615	0.089	positive
Rubus parvifolia	0.539	0.125	positive
Solanum pungetium	0.539	0.071	positive
Lomandra longifolia	0.692	0.539	frequent
Pteridium esculentum	0.615	0.554	frequent
Eucalyptus angophoroides	0.077	0.044	uninformative
Eucalyptus badjensis	0.077	0.006	uninformative
Eucalyptus cypellocarpa	0.231	0.304	uninformative
Eucalyptus fastigata	0.077	0.166	uninformative
Eucalyptus fraxinoides	0.077	0.056	uninformative
Eucalyptus globoidea	0.154	0.231	uninformative
Eucalyptus maidenii	0.077	0.055	uninformative
Eucalyptus viminalis	0.385	0.054	uninformative
Poa meionectes	0.231	0.584	negative

Table 70b. Habitat characteristics of Map Unit W6. Means and interquartile ranges for altitude and slope were calculated from n field samples, while those for annual rain were calculated from ESOCLIM predictions (see Table 5, text). Frequency terrain and parent material refers to number of samples (n) recorded in respective classes. Terrain classes: flat (slope ≤ 5°); north (slope > 5° and aspect < 30° or > 300°); intermediate (slope > 5° and aspect 30–120° or 210–300°); and south (slope > 5° and aspect 120–210°).

	Frequency (%)	Mean	Interquartile Range	n
Annual rain (mm)		986	971–1003	7
Altitude (m)		199	180–228	7
Slope (degrees)		4	1–2	7
Terrain class				
North	14			1
Intermediate	0			0
South	0			0
Flat	86			6
Parent material				
Devonian granitoids	57			4
Devonian high quartz sedimentaries	29			2
Ordovician high quartz sedimentaries	14			1

Vascular Flora of the South East Forests region, Eden, New South Wales

David A. Keith, Jackie Miles and Berin D. E. Mackenzie

Abstract

Keith, David A.[1], Miles, Jackie[2], and Mackenzie, Berin, D. E.[1] ([1]NSW National Parks and Wildlife Service, PO Box 1967, Hurstville, NSW, *Australia 2220; [2]Hawkshead Road, Brogo, NSW, Australia 2550) 1999. Vascular flora of the South East Forests region, Eden, New South Wales.* Cunninghamia *6(1): 219–281.* An exhaustive review of available information revealed 1522 native vascular plant taxa with confirmed records in the Eden region. A further 136 taxa potentially occur in the region, but these remain to be confirmed. Families represented by large numbers of taxa in the indigenous flora include the Fabaceae, Poaceae, Asteraceae, Myrtaceae and Orchidaceae. Species frequencies were highly skewed with 74% of the flora represented in less than 1% of survey samples and only three taxa represented in more than 40% of samples. A large number of records (350 taxa) were evaluated and refuted, emphasising the importance of critical validation when compiling biological inventory data from multiple sources. Errors are most likely to arise from nomenclatural synonymy and other duplications, misidentifications and erroneous locality information.

The confirmed vascular flora of the Eden region is relatively species-rich compared with other regions in tropical, temperate and semi-arid Australia, although these regions are less well-known botanically. However, the proportion of endemism (1%) is comparatively low, with 18 taxa unique to the region and a further 14 taxa with distributions extending just beyond the region. The Eden region includes 32 taxa listed as endangered or vulnerable in Australia and a further six taxa listed as endangered in New South Wales but not throughout Australia. Thirty-eight taxa were listed as rare in Australia and a further 39 were considered to be uncommon throughout their distribution. Four hundred and sixty-six taxa were considered to be uncommon within the Eden region. Two hundred and seventy-six taxa reached their distributional limits in the Eden region, about three quarters of these reaching their southern limits. Fifty taxa were represented in the region by disjunct populations.

Introduced taxa accounted for approximately 20% of the total regional vascular flora, although this proportion is likely to underestimate the introduced flora given the limitations of available data. The introduced flora is dominated by Poaceae, Asteraceae, Fabaceae and Caryophyllaceae. Very few introduced taxa were widespread in native vegetation. The most common introduced taxa were herbs with long-distance propagule dispersal mechanisms.

Introduction

Botanical exploration of the South East Forests region of New South Wales probably began with Ferdinand von Mueller's expedition to Twofold Bay and the upper Genoa River in 1860. However, the flora of the region remained poorly known until 1980 when there was a sustained increase in botanical exploration and vegetation survey within the region. A checklist of vascular plants in the South East Forests region was first compiled by Binns (1987) and this was subsequently updated by Doherty (1996). In the last twenty years, the region has become one of the best botanically known in Australia, with the discovery of approximately twenty plant species new to science, most of which are largely restricted to the region, and the development of a comprehensive floristic data base and vegetation map (Keith & Bedward 1999).

Our principal aim in this paper was to compile a validated checklist of the region's indigenous and introduced vascular flora by critically reviewing all available information. Sources of information, including herbarium specimens, references in the scientific literature, survey records, unpublished accounts and anecdotal observations varied widely in their coverage and reliability. Although herbarium collections and treatments in the taxonomic literature were the most reliable sources, their coverage was generally patchy, biased and unrepresentative relative to the coverage of survey records. Furthermore, in the absence of complete data bases, herbarium collections are relatively inaccessible and costly to search fully for a given region. We therefore sought to validate or refute survey records, unpublished accounts and anecdotal records either by locating specimens held in herbarium collections, or by our own direct observations and collections from the field. To assist future work, we documented all unresolved records for the region.

A secondary aim of this study was to document the relative abundance and conservation significance of plant taxa in the region. These factors were assessed using the floristic data base, reference to schedules of threatened species and assessment against conservation criteria described previously by Keith (1990).

Methods

Study Area

The study area corresponds to the Eden Forest Management Area (State Forests of NSW 1996) and lies between latitudes 36°05'–37°35'S and longitudes 148°40'–150°10'E. (Fig. 1) in far south-eastern New South Wales. It is bounded by the Tasman Sea to the east, the NSW-Victorian border in the south, the Monaro Tableland to the west and a line following watercourses and ridgelines between Kybean and Bermagui in the north. The region rises from sea level in the east to over 1200 m elevation in the north-west and is dominated by a granitoid batholith and sedimentary rocks that are metamorphosed to varying degrees. For a more detailed description of the region's landscape, geology, climate, vegetation and land use history, see Keith & Bedward (1999).

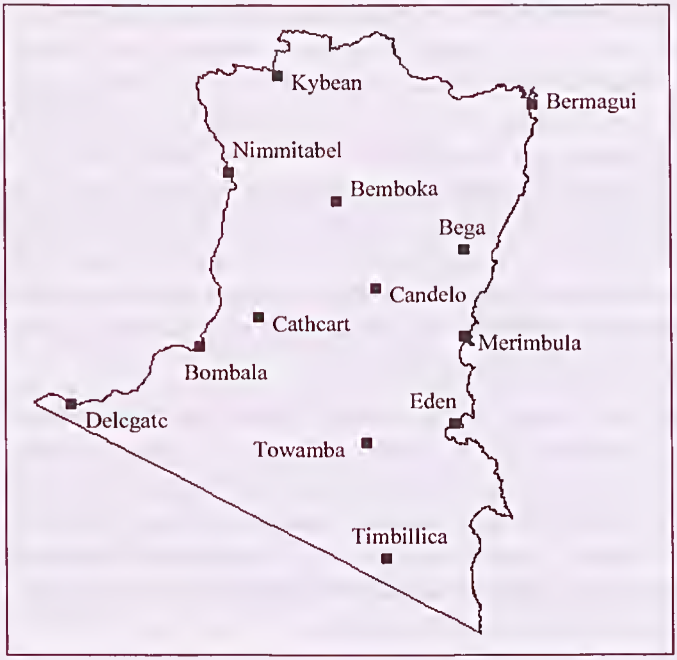


Fig. 1. South East Forests region study area.

Data compilation

A preliminary list of species was extracted from vegetation sample data compiled by Keith & Bedward (1999). This data set comprised 2906 samples of full floristic composition within quadrats mostly in the range 0.01–0.1 ha. The frequency of occurrence of each species among samples was recorded. Other species recorded previously by Binns (1987) and Keith & Ashby (1992) were added to this preliminary list.

Searches of herbarium collections held at Sydney (NSW), Canberra (ANBG) and Melbourne (MEL) were carried out to confirm survey records of each taxon on the preliminary list. Initially, the electronic databases held by NSW and ANBG were searched for all collections within the Eden region. The NSW database query was carried out on a minimal rectangle enclosing the study area bounded by latitudes 36°05'–37°35'S and longitudes 148°40'–150°10'E. The ANBG data base query was carried out on the NSW South Coast and Southern Tablelands botanical subdivisions (Anderson 1961). Records located within these query areas but outside the study area boundary were removed manually. Taxa on the preliminary list that were represented in the study area by a herbarium collection were transferred to a list of confirmed taxa. Searches of the herbarium data bases revealed numerous taxa that had not been recorded in the field survey and these were added to the confirmed list. Some other taxa that had been recorded during our field survey and verified with a specimen collection that was not retained in a public herbarium were also transferred to the confirmed list.

Herbarium collections held at NSW, ANBG and MEL were then searched manually for non databased records of taxa remaining on the preliminary list. While comprehensive herbarium searches for all taxa were precluded by constraints on time and resources, searches were carried out for most taxa on the residual list. As taxa were confirmed by herbarium collections, they were transferred to the confirmed list. For some taxa that remained unconfirmed by herbarium collections or other verified specimens, we consulted the taxonomic literature, taxonomic specialists and in some cases, the field botanists responsible for the original records. This yielded some hitherto unknown specimens or other convincing evidence that warranted transfer of some previously unresolved taxa to the confirmed list. Limited searches carried out in the field resulted in a small number of additional confirmations.

The origin and conservation significance of all listed taxa were assessed. Plants were determined as indigenous or introduced by consulting Harden (1990–1993). Australian native taxa were regarded as introduced if the study area was outside their known natural range and they were recorded only from disturbed habitats (e.g. wasteland, roadsides, regrowth) within the study area. Regional patterns of abundance were examined by calculating the frequency of occurrence of each taxon in the survey data set comprising 2906 samples.

The conservation significance of indigenous plant taxa was assessed using criteria described in Table 1 by updating the list in Keith & Ashby (1992) with newly available data. These criteria refer to varying levels of extinction risk (threat), habitat depletion, varying levels of rarity and endemism, and biogeographical phenomena such as distributional limits and disjunct populations (Table 1). The definitions of Criteria 2 and 3 were modified from earlier applications to accommodate schedules under the Commonwealth Endangered Species Protection Act (1992) and the NSW Threatened Species Conservation Act (1995). Criterion 2 now includes only taxa listed on one or both schedules. Criterion 3 now includes taxa listed in categories R (rare but not threatened in Australia) and K (poorly known) of Rare or Threatened Australian Plants (ROTAP, Briggs & Leigh 1996), as well as some additional taxa considered to be uncommon throughout their range. In previous applications of the criteria (Keith 1990, Keith & Ashby 1992), all taxa listed on ROTAP were included under Criterion 2, while only those considered uncommon throughout their range were included under Criterion 3. The definition of Criterion 5 has also been modified from previous applications to take advantage of the larger set of systematic survey data that is now available. Species were listed as regionally uncommon if present in less than ≤ 0.1% of the survey-records or if known to be represented only as very small populations scattered across the region. The identification of taxa presumed to be extinct within the region (Criterion 5X) is a further modification to previous applications of the criteria. There were too few collections of such taxa to permit statistical evaluation (e.g. Burgman et al. 1996), so taxa were presumed extinct in the region if they were not recorded for at least 50 years or if all known populations were known to be destroyed.

Table 1. Criteria for identification of plant taxa of conservation significance (modified from Keith 1990).

Criterion	Definition
1	Endemic to the region (i.e. found nowhere else).
2	Listed as threatened in Australia (E: endangered, V: vulnerable) on schedules of the Commonwealth Endangered Species Protection Act (1992) and/or in New South Wales (e: endangered, v: vulnerable) on schedules of the NSW Threatened Species Conservation Act (1995).
3	Rare (i.e. listed under category R by Briggs & Leigh 1996), poorly known and potentially rare or threatened (i.e. listed under category K by Briggs & Leigh 1996), or uncommon throughout range, but not threatened.
4	Restricted distribution outside region, but maybe locally common within region (i.e. majority of distribution falls within region).
5	Uncommon within region (occurring in 0.1% of samples unless otherwise known to be common, and/or in small populations).
5X	Presumed extinct within region if not recorded during last 50 years or if all populations known to be destroyed.
6	Habitat extensively depleted, or species harvested or collected, but not yet rare or threatened.
7	Geographic limit of distribution within the region (N: northern, S: southern limit, LN: local northern limit with disjunct population(s) known further north, LS: local southern limit with disjunct population(s) known further south).
8	Populations in the region disjunct from other occurrences of the taxon, usually separated by at least 100 km from other populations of the taxon.
9	Occupies habitat that is atypical relative to the majority of the taxon's distribution.

Botanical nomenclature

Botanical nomenclature was reviewed and standardised across all data sets. The names applied here therefore follow Harden (1990–1993) and changes subsequently accepted by the National Herbarium of NSW (e.g. Hill & Johnson 1995, Jacobs & Everett 1996, Linder & Verboom 1996, Briggs & Johnson 1998). Given that the data were compiled from numerous sources dated from 1979 to present, particular care was taken to resolve confounded taxonomy. Where two or more synonyms were applied to the same taxon in different data sets, these were updated to reflect currently accepted nomenclature. Where subspecific or varietal taxa were not always specified, the records were updated by adding the appropriate epithet if possible (e.g. if only one subspecies or variety was known from the region and nearby) or by reducing all the relevant records to species level.

Results and Discussion

Indigenous flora

The indigenous flora of the Eden region comprises a minimum of 1522 vascular plant taxa that were represented by confirmed records within the region (Appendix 1). Records of a further 136 taxa remain to be confirmed or refuted (Appendix 2). These included 86 taxa with potentially reliable but unconfirmed records within the region and 28 taxa not recorded within the region, but recorded nearby in habitats similar to those known to occur within the region. Almost half (47%) of the 86 taxa with unconfirmed records were monocots and most of these were orchids (15 taxa), grasses (9 taxa) and sedges (12 taxa). The taxonomic status of 19 of the unconfirmed taxa was uncertain, while the identifications of a further two taxa were uncertain. All except three of these uncertain taxa were dicots. Records of 350 taxa have been definitively refuted. The refuted taxa included many synonyms, other duplicated records and some erroneous identifications. For example, a specimen of *Acronychia wilcoxii* held at the National Herbarium of New South Wales was examined and redetermined as *Sarcomeliocope simplicifolia*.

The confirmed vascular flora comprised 79 (5%) pteridophytes, 5 (0.3%) gymnosperms, 997 (66%) dicots and 441 (29%) monocots, while the list of unconfirmed taxa had similar proportions. Plant families with high levels of representation in the confirmed regional flora included Fabaceae (141 taxa), Poaceae (129 taxa), Asteraceae (114 taxa), Myrtaceae (107 taxa) and Orchidaceae (100 taxa). Genera with high levels of representation include *Eucalyptus* (63 taxa), *Acacia* (50 taxa), *Pomaderris* (26 taxa), *Pultenaea* (20 taxa), *Juncus* (20 taxa), *Hibbertia* (18 taxa) and *Austrostipa* (18 taxa).

Hybrids or intermediate forms have been recorded between 35 pairs of taxa (Table 2). Fifteen of these were eucalypts, while 24 belonged to the families Myrtaceae, Proteaceae and Juncaceae, reflecting both the propensity for hybridisation and introgression, and the high level of taxonomic interest in these groups over many years. Some of the intermediate taxa have extensive distributions that extend beyond the occurrence of their parent taxa (e.g. *Eucalyptus botryoides-saligna*). Others are represented by sporadic individuals whose occurrence is restricted to the vicinity of the parent taxa (e.g. *Pomaderris aspera × cinerea*, syn. *P.* sp. C, Harden 1990). Some of the intermediate taxa have been formally described in the literature (e.g. *Persoonia × lucida*, *Acaena × anserovina*).

The frequency distribution of taxa amongst samples was highly skewed (Fig. 2a). Only three taxa were represented in more than 40% of samples (*Lomandra longifolia* subsp.. *longifolia* 50.3%, *Pteridium esculentum* 50.0% and *Poa meionectes* 44.8%). Twenty-three taxa were represented in more than 20% of samples, while 1115 taxa (74% of total confirmed flora) were represented in less than 1% of samples (Fig. 2a). The 20 most frequently recorded taxa in the region included five grasses and graminoids, four herbs, four vines, three trees, three shrubs and one fern. The infrequent taxa included some whose distribution was marginal to the study area (e.g. *Schizomeria ovata*), some that were spatially restricted (e.g. *Grevillea acanthifolia* subsp. *paludosa*) or specific to highly restricted habitats (e.g. *Westringia davidii*), some that were distributed sparsely within widespread habitats (e.g. *Santalum obtusifolium*) and some that had conspicuous growth forms only after temporally rare events (e.g. *Prasophyllum brevilabre*). Geophytes, particularly Orchidaceae, were disproportionately represented in the tail of the species frequency distribution.

Table 2: Pairs of taxa for which intermediate forms have been recorded in the South East Forests region.

Acaena novazelandiae × *A. ovina* (*A.* × *anserovina*)

Banksia marginata × *B. paludosa*

Corymbia gummifera × *C. maculata*

Cyathea australis × *C. leichhardtiana* (*C.* × *marcescens*)

Daviesia buxifolia × *D. mimosoides*

Derwentia derwentiana subsp. *derwentiana* × *D. derwentiana* subsp. *maideniana*

Eucalyptus agglomerata × *E. globoidea*

Eucalyptus baueriana × *E. bosistoana*

Eucalyptus bosistoana × *E. paniculata*

Eucalyptus botryoides × *E. saligna*

Eucalyptus camphora subsp. *humeana* × *E. ovata*

Eucalyptus camphora subsp. *humeana* × *E. viminalis*

Eucalyptus dives × *E. radiata*

Eucalyptus elata × *E. radiata*

Eucalyptus elata × *E. sieberi*

Eucalyptus globoidea × *E. yangoura*

Eucalyptus kybeanensis × *E. latiuscula*

Eucalyptus parvula × *E. viminalis*

Eucalyptus pauciflora × *E. ?dives*

Grevillea baueri × *G. lanigera*

Juncus australis × *J. filicaulis*

Juncus australis × *J. melanobasis*

Juncus filicaulis × *J. subsecundus*

Juncus fockei × *J. holoschoenus*

Juncus mollis × *J. usitatus*

Lomandra longifolia × *L. confertifolia*

Lomatia fraseri × *L. myricoides*

Olearia erubescens × *O. megalophylla*

Persoonia asperula × *P. chamaepeuce*

Persoonia levis × *P. linearis* (*P.* × *lucida*)

Phebalium squamulosum subsp. *squamulosum* × *P. squamulosum* subsp. *argenteum*

Pittosporum undulatum × *P. bicolor*

Pomaderris aspera × *P. cinerea* (*P.* sp. C)

Xanthorrhoea australis × *X. resinifera*

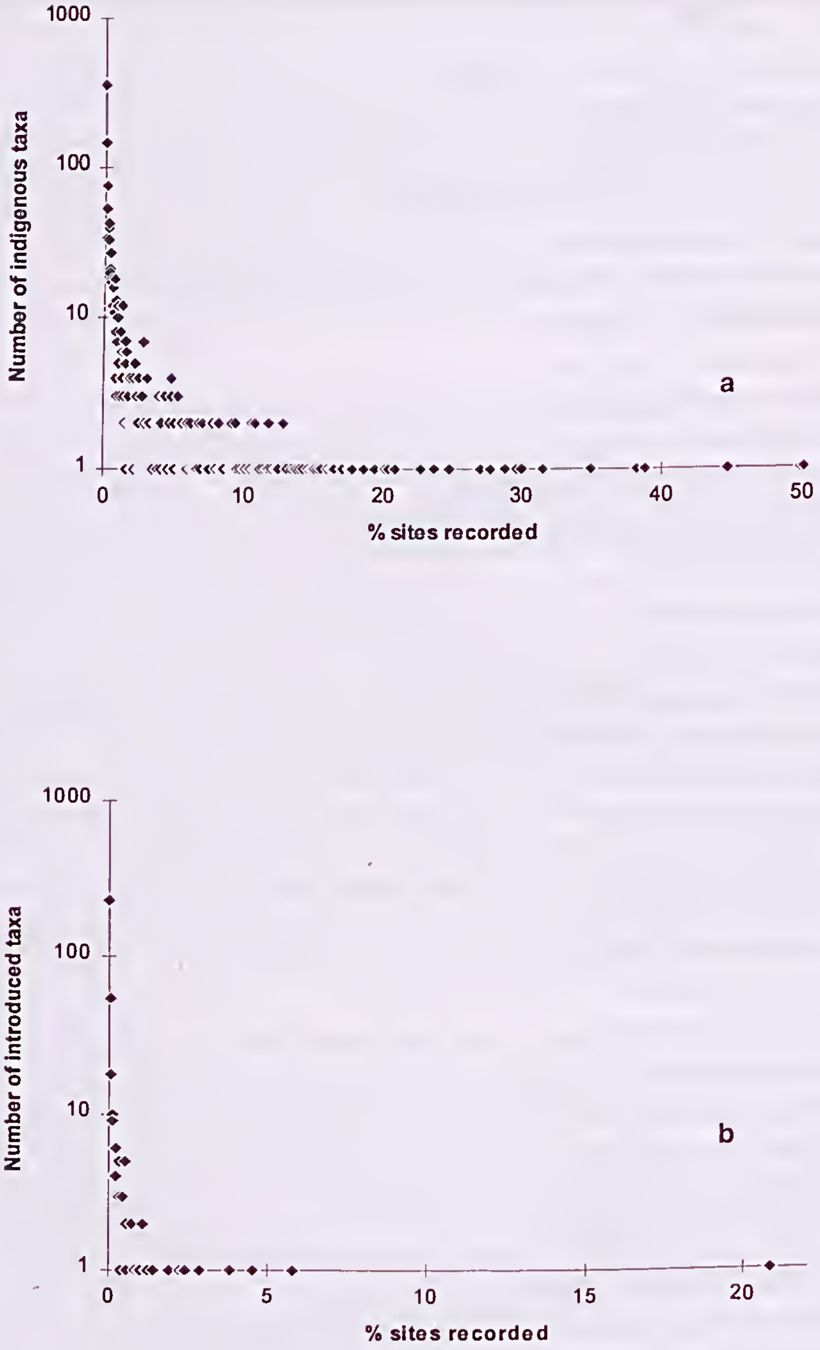


Fig. 2. Frequency distribution of species among 2906 samples: a, indigenous flora; and b, introduced flora.

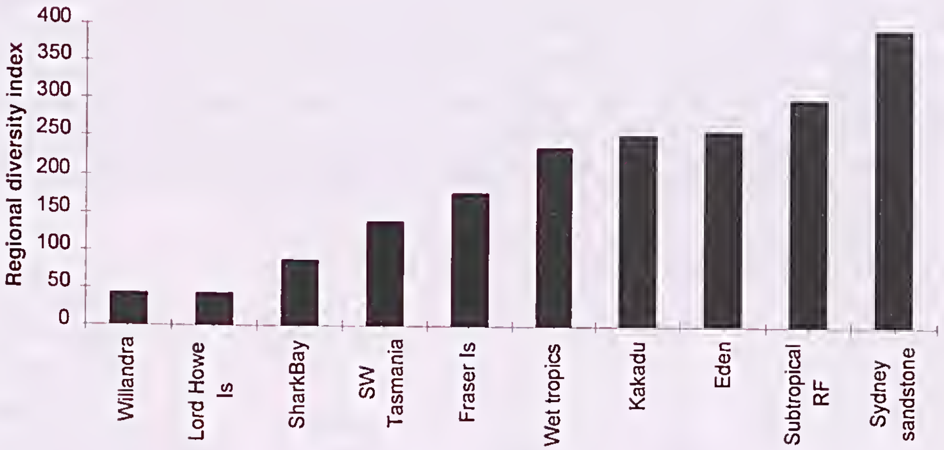


Fig. 3. Regional diversity index (D=S/logA, see text) for vascular flora of ten regions (data from James (1994) except Eden, this study).

Comparisons with other regional floras must be made with caution, because Eden has had a higher level of botanical exploration than most other regions except the Sydney region, while tropical regions in particular, are poorly known. Nonetheless, the indigenous Eden regional flora is comparatively diverse, relative to other Australian regional floras (Fig. 3, James 1994). The floristic diversity of the Eden region was compared with that of other Australian regions assuming an exponential species-area relationship to calculate a regional diversity index D=S/logA, where S is the number of taxa in the region and A is the area of the region in hectares. The Eden region has a comparatively rich flora (1522 spp.) for an area of its size (810 000 ha). Tropical regions such as north-east Queensland Wet Tropics (900 000 ha) and Kakadu National Park (2 000 000 ha) have similar diversity indices, with 1400 and 1600 vascular plant taxa, respectively, although the latter region is two and a half times the size of the Eden region. Semi-arid regions such as Willandra Lakes and Shark Bay World Heritage Areas have less diverse floras (240 spp. in 600 000 ha and 620 spp. in 15 000 000 ha, respectively), as does the cool temperate western Tasmanian wilderness (860 spp., 1 400 000 ha) and the Fraser Island/Cooloola subtropical sand mass (920 spp., 160 000 ha). However, the flora of the Eden region is less diverse than that of the Sydney sandstone region (2500 spp., 1 900 000 ha), and the East Coast subtropical rainforest parks (1600 spp., although this latter 'region' comprises several disjunct areas totalling 270 000 ha).

The Eden region has a comparatively low level of floristic endemism (1.1% cf. 5–36% for all other regions except Kakadu and Willandra, Fig. 4). Island floras and rainforest floras had the highest proportion of endemic taxa.

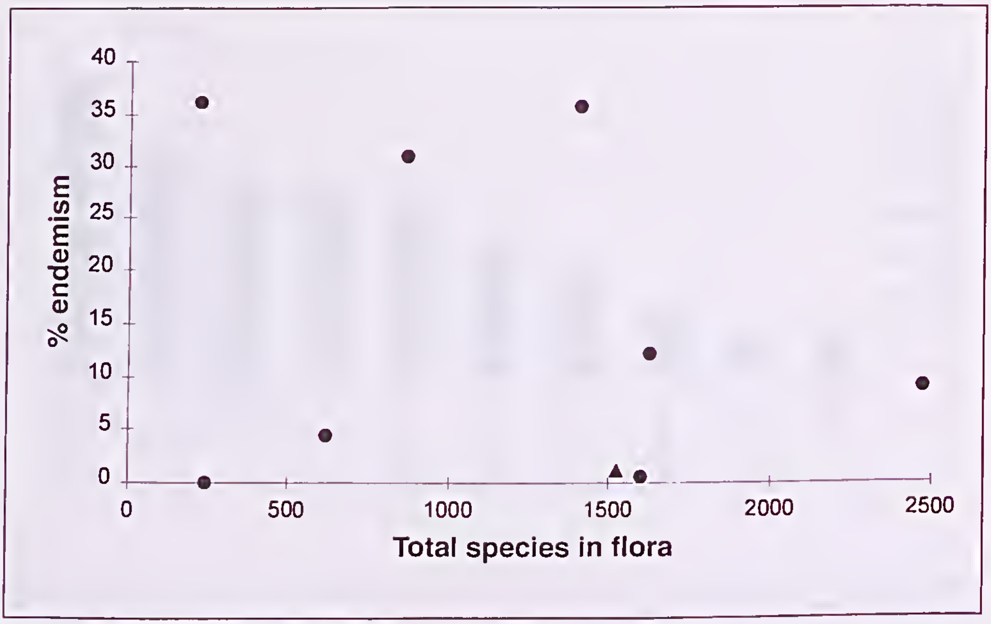


Fig. 4. Endemism in eight regional floras (round symbols, data from James 1994), compared with Eden (triangular symbol).

Plant species of special conservation significance

Almost 700 taxa listed in Appendix 1 met one or more of the nine conservation criteria described in Table 1. Thirty-eight taxa (Tables 3 & 4) were listed as threatened on schedules of the Commonwealth Endangered Species Protection Act (1992), the NSW Threatened Species Conservation Act (1995) or both (Criterion 2). Several of these were either endemic (Category 1, 12 taxa) or largely restricted to the Eden region (Criterion 4, 3 taxa). Six additional endemic taxa and eleven further taxa largely confined to the region were not currently listed as threatened. Eleven of the 38 threatened taxa were endangered nationally, while a further six were endangered in New South Wales (Table 3). The remaining 21 threatened taxa were vulnerable, both in Australia and New South Wales.

Thirty-eight of the 77 taxa considered rare or uncommon throughout their range (Criterion 3, Table 4) were listed as nationally rare by Briggs & Leigh (1996), including three regional endemics (Criterion 1) and seven taxa largely restricted to the Eden region (Criterion 4, Table 4). Of the remaining 39 taxa listed under Category 3, a few are yet to be assessed for listing under state and commonwealth legislation (e.g. *Astrotricha* sp. (Nadgee), *Grevillea irrassa* subspecies). Four hundred and sixty-six taxa were considered uncommon within the region (Category 5, Table 4), although these may be common elsewhere.

Eighteen taxa persist as relict populations in depleted, fragmented habitats or have populations depleted by collecting or harvesting activities (Category 6, Table 4). Most of these taxa occur in widespread habitats that have been extensively cleared or modified, but they may still persist in reasonable numbers throughout their full range.

Table 3. Threatened and rare taxa occurring in the South East Forests region. Aust. indicates status on the schedule of the Commonwealth Endangered Species Protection Act 1992 (E: Endangered and V: Vulnerable, respectively, in Australia); NSW indicates status on the schedule of the NSW Threatened Species Conservation Act 1995 (e: endangered and v: vulnerable, respectively, in NSW); and ROTAP indicates taxa considered rare in Australia but not threatened by Briggs & Leigh 1996 (2: distributional range < 100 km, 3: range > 100 km, R: rare but not threatened in Australia, C: represented in a conservation reserve, a: more than 1000 plants known from a conservation reserve, i: less than 1000 plants known from a conservation reserve, t: total distribution contained within a conservation reserve).

	Conservation Status		
	Aust.	**NSW**	**ROTAP**
Acacia blayana			2RC-
Acacia constablei	V	v	
Acacia costiniana			3RCa
Acacia covenyi			2RCa
Acacia georgensis	V	v	
Acacia kydrensis			2RCa
Acacia lucasii			3RCa
Acacia subtilinervis			3RCa
Asplenium obtusatum	V		
Baeckea denticulata			3RCa
Boronia deanei	V	v	
Burnettia cuneata			3RC-
Caladenia tesselata	V	v	
Calotis glandulosa	V	v	
Carex capillacea			3RC-
Correa baeuerlenii	V	v	
Cryptostylis hunteriana	V	v	
Dampiera fusca			3RCi
Daviesia suaveolens			3RCa
Deyeuxia talariata			3RCi
Dichelachne parva	V		
Discaria pubescens			3RCa
Diuris ochroma	V		
Diuris pedunculata	E	e	
Dodonaea procumbens	V	v	
Dodonaea rhombifolia			3RCa
Eucalyptus badjensis			2RCi
Eucalyptus baeuerlenii			3RCa
Eucalyptus gregsoniana			3RCa
Eucalyptus imlayensis	E	e	
Eucalyptus latiuscula			3RC-
Eucalyptus olsenii			2RC-t
Eucalyptus paliformis			2RCat
Eucalyptus parvula	V	v	
Eucalyptus spectatrix			2RC-

Table 3. cont.

	Conservation Status		
	Aust.	**NSW**	**ROTAP**
Eucalyptus wilcoxii			2RCat
Genoplesium rhyoliticum	E	e	
Grevillea acanthifolia subsp. *paludosa*	E	e	
Haloragodendron baeuerlenii			3RCa
Haloragodendron monospermum			3RC-
Hibbertia hermanniifolia			3RCa
Lepidium hyssopifolium	E	e	
Monotoca rotundifolia		e	
Myoporum bateae			3RC-
Persoonia brevifolia			2RCa
Phebalium carruthersii			3RC-
Phebalium ellipticum			2RCa
Phebalium ralstonii	V	v	
Phebalium rhytidophyllum	V	v	
Pomaderris brogoensis			3RC-
Pomaderris costata			3RC-
Pomaderris cotoneaster	E	e	
Pomaderris elachophylla		e	
Pomaderris pallida	V	v	
Pomaderris parrisiae	V	v	
Pomaderris pauciflora			3RC-
Pomaderris virgata			3RC-
Prasophyllum affine	E	e	
Prostanthera walteri			3RCa
Pseudanthus divaricatissimus			3RCa
Pseudanthus ovalifolius		e	
Pultenaea parrisiae subsp. *parrisiae*	V	v	
Pultenaea pedunculata			
Rulingia hermanniifolia			3RCa
Rutidosis leiolepis	V	v	
Senecio spathulatus		e	
Senecio squarrosus		e	
Spyridium cinereum			3RCa
Styphelia psiloclada			3RC-
Thesium australe	V	v	
Viola cleistogamoides		e	
Westringia davidii	V	v	
Westringia kydrensis	E	e	
Zieria sp. D (*citriodora* ms)	V	v	
Zieria sp. G (*buxijugum* ms)	E	e	
Zieria sp. H (*formosa* ms)	E	e	
Zieria sp. I (*parrisiae* ms)	E	e	

Table 4: Number of taxa meeting conservation criteria. Refer to Table 1 for explanations of criteria (note some taxa meet multiple criteria).

Conservation criterion	Number of taxa meeting criterion
1. Regionally endemic	18
2. Threatened in Australia or NSW	38
3. Rare or uncommon throughout distribution	77
4. Restricted distribution outside region	14
5. Regionally uncommon	466
5X. Presumed regionally extinct	7
6. Depleted in the wild	18
7. Distributional limit	276
[northern limit 56]	
[southern limit 201]	
[local northern limit 12]	
[local southern limit 7]	
8. Disjunct population	50
9. Atypical habitat	9

The confirmed indigenous flora included seven species that have not been recorded for 50 or more years, despite recent survey effort and thus may now be extinct within the region. These were *Deschampsia caespitosa* last recorded at Nimmitabel in 1896, *Callitris muelleri* last recorded in 1901, *Acacia paradoxa* last recorded near Eden in 1913, *Eryngium rostratum* last recorded at Bombala in 1914, *Sebaea ovata* last recorded at Mt Imlay in 1916, *Ammobium alatum* last recorded near Bega and Cobargo c. 1920 and *Trochocarpa laurina* last recorded in 1952.

Eighteen taxa were endemic to the Eden region (Category 1, Table 4), while a further 14 taxa were largely restricted to the Eden region (Category 4, Table 4). Two hundred and seventy-six taxa reached their limit of distribution within the Eden region (Category 7, Table 4), including 201 southern limits and 56 northern limits. As noted elsewhere, this disparity suggests latitudinal species turnover and a trend of decreasing diversity with latitude (Keith 1990). For 19 taxa reaching local distributional limits, the Eden region was on the edge of major disjunctions in their range. A further 50 taxa were recorded from locations in the Eden region that were disjunct from their main area of distribution (Category 8, Table 4), while nine taxa were represented in habitats that were not typical of the majority of their distribution (Category 9, Table 4).

Introduced flora

A total of 374 introduced taxa were recorded for the region, although a relatively high proportion of these were not represented in herbarium collections (Appendix 3). Three taxa (1%) were conifers, 98 (26%) were monocots, 273 (73%) were dicots and there were no introduced pteridophytes recorded. Introduced taxa accounted for 20% of the total vascular flora of the region (c. 1900 taxa). The frequency distribution of introduced taxa was even more highly skewed than that of indigenous flora, with 83% of introduced taxa recorded in 0.1% of samples or less (Fig. 2b). This pattern may indicate a bias in survey and collection work against likely weed habitats such as wastelands and semi-natural pastures. If so, the available data are likely to underestimate the total introduced flora of the region and it is also likely that numerous unconfirmed introduced taxa will be confirmed with additional collection and survey effort.

The introduced flora was dominated by the families Poaceae (67 taxa), Asteraceae (46 taxa), Fabaceae (38 taxa) and Caryophyllaceae (15 taxa). Almost all of the introduced taxa originated from abroad. However, a small number of taxa indigenous to other parts of Australia are likely to have become naturalised in the region since European settlement. These include four *Acacia* species from drier parts of eastern Australia and one grass from coastal habitats (*Cynodon dactylon*).

The most widespread and frequently recorded introduced taxa were Asteraceous herbs found at low local abundance across large areas of forest. These included *Hypochoeris* radicata (21% of samples), *Cirsium vulgare* (6%) and *Conyza albida* (5%). Of 17 introduced taxa recorded in more than 1% of samples, 15 were herbs (including five in the family Asteraceae), one was a grass (*Paspalum dilatatum*) and one was a shrub (*Rubus ulmifolius*). These species have mechanisms for extensive seed dispersal and an ability to establish in disturbed habitats. Riparian zones in agricultural and urban areas support a diverse introduced flora including woody species such as *Salix* spp. and *Rubus* spp., and herbaceous species in the families Juncaceae and Poaceae.

Conclusions

The confirmed indigenous vascular flora of the Eden region (1522 taxa) is relatively species-rich compared with other regions in tropical, temperate and semi-arid Australia, although these regions are less well-known botanically. However, the proportion of endemism (1%) is comparatively low, with 18 taxa unique to the region and a further 14 taxa with distributions extending just beyond the region. The region includes a moderately large number of rare and threatened plant taxa (Table 3) compared with other Australian regions (Briggs & Leigh 1996). A large number of additional taxa are of regional conservation significance because of distributional limits, disjunct populations, regional rarity or atypical habitat relationships. Introduced taxa make up a large proportion (20%) of the total regional vascular flora, but this may be typical of regions containing both large natural landscapes and modified landscapes.

Species frequencies within the indigenous flora were highly skewed with 74% of the flora represented in less than 1% of survey samples and only three taxa represented in more than 40% of samples. This conforms with patterns established in other regional biotas (Keith 1990). Many of the taxa in the tail of the ranked abundance distributions are likely to be abundant somewhere within their range (Murray et al. 1999). Nonetheless, restriction of such a high proportion of regional diversity to a small number of locations presents a major challenge for conservation planners and managers charged with maintaining full regional biodiversity.

Despite an exhaustive review of available information, records of 136 indigenous taxa remain to be confirmed or refuted in the region. The large number of records (350 taxa) that were evaluated and refuted emphasise the importance of critical validation when compiling biological inventory data from multiple sources. Errors are most likely to arise from nomenclatural synonymy and other duplications, misidentifications and erroneous locality information.

Acknowledgements

We are grateful to all who contributed plant specimens, survey records and specialist advice. In particular, David Albrecht, Doug Binns, Phil Gilmour and Heather Stone have contributed much to our knowledge of the flora of this interesting region. Michael Bedward provided invaluable assistance in data management and participated in many vigorous and entertaining discussions about data quality. We are most grateful to Michael Doherty for a very thorough review of the manuscript. We thank the directors of the National Herbaria of New South Wales and Victoria, the Centre for Plant Diversity, NSW National Parks & Wildlife Service and State Forests of NSW for access to botanical data held by those organisations.

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Manuscript accepted 3 March 1999

Appendix 1: Indigenous vascular plant taxa with confirmed occurrences in the Eden region. % Freq. is the percentage of 2906 florisitc samples in which respective taxa were recorded. Columns labelled 1–9 indicates which conservation criteria (see Table 1) were met (+) by each taxon. For criterion 7: N: northern limit; S: southern limit; LN: local northern limit; and LS: local southern limit.

	Freq. (%)	1	2	3	4	5	5X	6	7	8	9
PSILOPSIDA											
Psilotaceae											
Tmesipteris obliqua	0	-	-	-	-	-	-	-	-	-	-
Tmesipteris ovata	0	-	-	-	-	+	-	-	-	-	-
Tmesipteris parva	0.28	-	-	-	-	-	-	-	-	-	-
Tmesipteris truncata	0.14	-	-	+	-	-	-	-	S	-	-
LYCOPSIDA											
Lycopodiaceae											
Huperzia myrtifolia	0	-	-	-	-	+	-	-	-	-	-
Lycopodiella lateralis	0.17	-	-	-	-	-	-	-	-	-	-
Lycopodium deuterodensum	0.65	-	-	-	-	-	-	-	-	-	-
Selaginellaceae											
Selaginella uliginosa	1.14	-	-	-	-	-	-	-	-	-	-
FILICOPSIDA											
Adiantiaceae											
Adiantum aethiopicum	6.85	-	-	-	-	-	-	-	-	-	-
Adiantum formosum	0.86	-	-	-	-	-	-	-	-	-	-
Adiantum hispidulum	0.58	-	-	-	-	-	-	-	-	-	-
Aspleniaceae											
Asplenium australasicum	0.28	-	-	-	-	-	-	-	S	-	-
Asplenium bulbiferum subsp. *gracillimum*	0.21	-	-	-	-	-	-	-	-	-	-
Asplenium flabellifolium	10.05	-	-	-	-	-	-	-	-	-	-
Asplenium flaccidum subsp. *flaccidum*	0.03	-	-	-	-	+	-	-	-	-	-
Asplenium obtusatum	0	-	+	-	-	-	-	-	-	-	-
Asplenium polydon	0	-	-	-	-	+	-	-	-	-	-
Asplenium trichomanes subsp. *quadrivalens*	0.03	-	-	-	-	+	-	-	-	-	-
Pleurosorus rutifolius	0	-	-	-	-	+	-	-	-	-	-
Athryriaceae											
Diplazium australe	0.14	-	-	-	-	-	-	-	-	-	-
Azollaceae											
Azolla pinnata	0	-	-	-	-	-	-	-	-	-	-
Blechnaceae											
Blechnum cartilagineum	9.84	-	-	-	-	-	-	-	-	-	-
Blechnum minus	0.86	-	-	-	-	-	-	-	-	-	-
Blechnum nudum	6.30	-	-	-	-	-	-	-	-	-	-
Blechnum patersonii subsp. *patersonii*	0.96	-	-	-	-	-	-	-	-	-	-
Blechnum penna-marina subsp. *alpina*	0.03	-	-	-	-	-	-	+	-	-	-
Blechnum wattsii	3.34	-	-	-	-	-	-	-	-	-	-
Doodia aspera	10.53	-	-	-	-	-	-	-	-	-	-
Doodia caudata var. *caudata*	0.14	-	-	-	-	-	-	-	-	-	-
Doodia media subsp. *media*	0.07	-	-	-	-	+	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Cyatheaceae											
Cyathea australis	9.39	-	-	-	-	-	-	-	-	-	-
Cyathea leichhardtiana	0.17	-	-	-	-	+	-	-	-	-	-
Davalliaceae											
Arthropteris tenella	0.03	-	-	-	-	+	-	-	S	-	-
Davallia pyxidata	0.07	-	-	-	-	+	-	-	LS	-	
Rumohra adiantiformis	0.21	-	-	-	-	-	-	-	-	-	-
Dennstaedtiaceae											
Dennstaedtia davallioides	0.48	-	-	-	-	-	-	-	-	-	-
Histiopteris incisa	1.27	-	-	-	-	-	-	-	-	-	-
Hypolepis glandulifera	1.10	-	-	-	-	-	-	-	-	-	-
Hypolepis muelleri	0.69	-	-	-	-	-	-	-	-	-	-
Pteridium esculentum	49.93	-	-	-	-	-	-	-	-	-	-
Dicksoniaceae											
Calochlaena dubia	9.39	-	-	-	-	-	-	-	-	-	-
Dicksonia antarctica	4.61	-	-	-	-	-	-	-	-	-	-
Dryopteridaceae											
Lastreopsis acuminata	0.72	-	-	-	-	-	-	-	-	-	-
Lastreopsis decomposita	0.79	-	-	-	-	-	-	-	-	-	-
Lastreopsis microsora	1.58	-	-	-	-	-	-	-	-	-	-
Polystichum formosum	0	-	-	-	-	+	-	-	-	+	-
Polystichum proliferum	6.23	-	-	-	-	-	-	-	-	-	-
Gleicheniaceae											
Gleichenia dicarpa	0.55	-	-	-	-	-	-	-	-	-	-
Gleichenia microphylla	0.31	-	-	-	-	-	-	-	-	-	-
Gleichenia rupestris	0	-	-	-	-	+	-	-	S	-	-
Sticherus flabellatus	0.07	-	-	-	-	-	-	-	-	-	-
Sticherus lobatus	1.07	-	-	-	-	-	-	-	-	-	-
Sticherus tener	0	-	-	-	-	+	-	-	-	-	-
Grammitaceae											
Grammitis billardieri	0.17	-	-	-	-	-	-	-	-	-	-
Hymenophyllaceae											
Hymenophyllum cupressiforme	0.86	-	-	-	-	-	-	-	-	-	-
Hymenophyllum flabellatum	0.17	-	-	-	-	-	-	-	-	-	-
Macroglena caudata	0.03	-	-	-	-	+	-	-	-	-	-
Polyphlebium venosum	0.34	-	-	-	-	-	-	-	-	-	-
Lindsaeaceae											
Lindsaea linearis	2.86	-	-	-	-	-	-	-	-	-	-
Lindsaea microphylla	2.27	-	-	-	-	-	-	-	-	-	-
Marsileaceae											
Marsillea costulifera	0	-	-	-	-	+	-	-	-	-	-
Marsillea hirsuta	0	-	-	-	-	+	-	-	-	-	-
Ophioglossaceae											
Botrychium australe	0.28	-	-	+	-	-	-	-	-	-	-
Ophioglossum lusitanicum subsp. *coriacium*	0	-	-	-	-	+	-	-	-	-	-
Osmundaceae											
Todea barbara	0.52	-	-	-	-	-	-	-	-	-	-
Polypodiaceae											
Microsorum pustulatum	1.27	-	-	-	-	-	-	-	-	-	-
Microsorum scandens	0.96	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**S**	**SX**	**6**	**7**	**8**	**9**
Polypodiaceae cont.											
Platycerium bifurcatum subsp. *bifurcatum*	0.07	-	-	-	-	+	-	-	S	-	-
Pyrrosia rupestris	2.34	-	-	-	-	-	-	-	-	-	-
Pteridaceae											
Pteris tremula	1.38	-	-	-	-	-	-	-	-	-	-
Pteris umbrosa	0.93	-	-	-	-	-	-	-	-	-	-
Pteris sp. aff. *comans*	0.17	-	-	-	-	+	-	-	-	+	-
Schizaeaceae											
Schizaea asperula	0.17	-	-	-	-	-	-	-	-	-	-
Schizaea bifida	0.24	-	-	-	-	-	-	-	-	-	-
Sinopteridaceae											
Cheilanthes austrotenuifolia	0.69	-	-	-	-	-	-	-	-	-	-
Cheilanthes distans	0.21	-	-	-	-	-	-	-	-	-	-
Cheilanthes sieberi subsp. *sieberi*	4.13	-	-	-	-	-	-	-	-	-	-
Pellaea falcata var. *falcata*	8.26	-	-	-	-	-	-	-	-	-	-
Pellaea falcata var. *nana*	0.14	-	-	-	-	+	-	-	-	-	-
CONIFEROPSIDA											
Cupressaceae											
Callitris endlicheri	0.24	-	-	-	-	-	-	-	-	-	-
Callitris muelleri	0	-	-	-	-	+	+	-	S	+	-
Callitris rhomboidea	0.24	-	-	-	-	-	-	-	-	-	-
Podocarpaceae											
Podocarpus spinulosus	0	-	-	-	-	+	-	-	S	+	-
CYCADOPSIDA											
Zamiaceae											
Macrozamia communis	4.51	-	-	-	-	-	-	-	S	-	-
MAGNOLIOPSIDA (LILIIDAE)											
Alismataceae											
Alisma plantago-aquatica	0.03	-	-	-	-	-	-	-	-	-	-
Anthericaceae											
Arthropodium milleflorum	3.79	-	-	-	-	-	-	-	-	-	-
Arthropodium minus	1.69	-	-	-	-	-	-	-	-	-	-
Caesia calliantha	0	-	-	-	-	+	-	-	-	-	-
Caesia parviflora var. *parviflora*	0.24	-	-	-	-	-	-	-	-	-	-
Caesia parviflora var. *vittata*	0.21	-	-	-	-	-	-	-	-	-	-
Dichopogon fimbriatus	0	-	-	-	-	+	-	-	-	-	-
Laxmannia gracilis	0.10	-	-	-	-	+	-	-	-	-	-
Sowerbaea juncea	0.21	-	-	-	-	-	-	-	-	-	-
Thysanotus juncifolius	0.03	-	-	-	-	+	-	-	-	-	-
Thysanotus patersonii	0	-	-	-	-	+	-	-	-	-	+
Thysanotus tuberosus	1.31	-	-	-	-	-	-	-	-	-	-
Tricoryne elatior	0.24	-	-	-	-	-	-	-	-	-	-
Arecaceae											
Livistona australis	0.07	-	-	-	-	+	-	-	-	-	-
Asphodelaceae											
Bulbine bulbosa	0.07	-	-	-	-	-	-	+	-	-	-
Bulbine glauca	0	-	-	-	-	+	-	-	-	-	-
Bulbine semibarbata	0.10	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Centrolepidaceae											
Centrolepis aristata	0	-	-	-	-	+	-	-	-	-	-
Centrolepis fascicularis	0.10	-	-	-	-	+	-	-	-	-	-
Centrolepis strigosa subsp. *strigosa*	0.21	-	-	-	-	-	-	-	-	-	-
Colchicaceae											
Burchardia umbellata	1.38	-	-	-	-	-	-	-	-	-	-
Wurmbea biglandulosa	0	-	-	-	-	+	-	-	-	-	-
Wurmbea dioica	0.14	-	-	-	-	-	-	-	-	-	-
Commelinaceae											
Aneilema biflorum	0.03	-	-	-	-	+	-	-	S	-	-
Commelina cyanea	2.79	-	-	-	-	-	-	-	S	-	-
Cyperaceae											
Baumea acuta	0.03	-	-	-	-	+	-	-	-	-	-
Baumea articulata	0	-	-	-	-	+	-	-	-	-	-
Baumea gunnii	0.03	-	-	-	-	-	-	-	-	-	-
Baumea juncea	0.89	-	-	-	-	-	-	-	-	-	-
Baumea rubiginosa	0.58	-	-	-	-	-	-	-	-	-	-
Baumea teretifolia	0.07	-	-	-	-	+	-	-	-	-	-
Baumea tetragona	0.24	-	-	-	-	-	-	-	-	-	-
Carex appressa	5.47	-	-	-	-	-	-	-	-	-	-
Carex bichenoviana	0	-	-	-	-	+	-	-	-	-	-
Carex breviculmis	4.78	-	-	-	-	-	-	-	-	-	-
Carex brownii	0.07	-	-	-	-	+	-	-	-	-	-
Carex capillacea	0.03	-	-	+	-	-	-	-	-	-	-
Carex declinata	0	-	-	-	-	+	-	-	S	+	-
Carex fascicularis	0.03	-	-	-	-	+	-	-	-	-	-
Carex gaudichaudiana	0.58	-	-	-	-	-	-	-	-	-	-
Carex inversa	1.93	-	-	-	-	-	-	-	-	-	-
Carex longebrachiata	2.10	-	-	-	-	-	-	-	-	-	-
Carex polyantha	0.03	-	-	-	-	+	-	-	-	-	-
Carex pumila	0.34	-	-	-	-	-	-	-	-	-	-
Carex tereticaulis	0	-	-	-	-	+	-	-	-	-	-
Caustis flexuosa	2.27	-	-	-	-	-	-	-	-	-	-
Caustis pentandra	0.31	-	-	-	-	-	-	-	-	-	-
Caustis recurvata var. *recurvata*	0	-	-	-	-	+	-	-	S	-	-
Cyathochaeta diandra	0.45	-	-	-	-	-	-	-	-	-	-
Cyperus brevifolius	0	-	-	-	-	+	-	-	-	-	-
Cyperus gracilis	0.17	-	-	-	-	-	-	-	-	-	-
Cyperus gunnii subsp. *gunnii*	0	-	-	-	-	+	-	-	-	-	-
Cyperus imbecillis	0.03	-	-	-	-	+	-	-	S	-	-
Cyperus laevigatus	0.03	-	-	-	-	+	-	-	S	-	-
Cyperus lhotskyanus	0	-	-	-	-	+	-	-	-	-	-
Cyperus lucidus	0.96	-	-	-	-	-	-	-	-	-	-
Cyperus sanguinolentus	0.07	-	-	-	-	+	-	-	-	-	-
Cyperus sphaeroideus	0.07	-	-	-	-	+	-	-	-	-	-
Eleocharis acuta	0.03	-	-	-	-	-	-	-	-	-	-
Eleocharis gracilis	0.48	-	-	-	-	-	-	-	-	-	-
Eleocharis sphacelata	0.10	-	-	-	-	-	-	-	-	-	-
Gahnia aspera	1.27	-	-	-	-	-	-	-	S	-	-
Gahnia clarkei	0.21	-	-	-	-	-	-	-	-	-	-
Gahnia filum	0.52	-	-	-	-	-	-	-	-	-	-
Gahnia melanocarpa	7.98	-	-	-	-	-	-	-	-	-	-
Gahnia microstachya	0.31	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Cyperaceae cont.											
Gahnia radula	8.50	-	-	-	-	-	-	-	-	-	-
Gahnia sieberiana	5.54	-	-	-	-	-	-	-	-	-	-
Gahnia subaequiglumis	0.24	-	-	-	-	+	-	-	-	-	-
Gymnoschoenus sphaerocephalus	0.38	-	-	-	-	-	-	-	-	-	-
Isolepis aucklandica	0.03	-	-	-	-	+	-	-	-	-	-
Isolepis cernua	0.10	-	-	-	-	-	-	-	-	-	-
Isolepis crassiuscula	0	-	-	-	-	+	-	-	-	-	-
Isolepis habra	0.65	-	-	-	-	-	-	-	-	-	-
Isolepis inundata	1.31	-	-	-	-	-	-	-	-	-	-
Isolepis nodosa	2.06	-	-	-	-	-	-	-	-	-	-
Isolepis platycarpa	0	-	-	-	-	+	-	-	-	-	-
Isolepis producta	0	-	-	-	-	+	-	-	-	-	-
Isolepis subtilissima	0.28	-	-	-	-	-	-	-	-	-	-
Lepidosperma concavum	0.31	-	-	-	-	-	-	-	-	-	-
Lepidosperma curtisiae	0	-	-	-	-	+	-	-	-	-	-
Lepidosperma elatius	0.10	-	-	-	-	-	-	-	-	-	-
Lepidosperma filiforme	1.14	-	-	-	-	+	-	-	-	-	-
Lepidosperma forsythii	0.31	-	-	-	-	+	-	-	-	-	-
Lepidosperma gladiatum	0.34	-	-	-	-	-	-	-	-	-	-
Lepidosperma gunnii	1.45	-	-	-	-	-	-	-	-	-	-
Lepidosperma latens	0	-	-	-	-	+	-	-	S	+	-
Lepidosperma laterale	34.96	-	-	-	-	-	-	-	-	-	-
Lepidosperma limicola	0.28	-	-	-	-	-	-	-	-	-	-
Lepidosperma longitudinale	0	-	-	-	-	+	-	-	-	-	-
Lepidosperma neesii	0.86	-	-	-	-	-	-	-	-	-	-
Lepidosperma semiteres	0.03	-	-	-	-	+	-	-	LN	-	-
Lepidosperma tortuosum	0.62	-	-	-	-	-	-	-	-	-	-
Lepidosperma urophorum	8.40	-	-	-	-	-	-	-	-	-	-
Ptilothrix deusta	0.07	-	-	-	-	+	-	-	S	-	-
Schoenoplectus mucronatus	0	-	-	-	-	+	-	-	S	+	-
Schoenoplectus validus	0	-	-	-	-	-	-	-	-	-	-
Schoenus apogon	1.51	-	-	-	-	-	-	-	-	-	-
Schoenus brevifolius	0.72	-	-	-	-	-	-	-	-	-	-
Schoenus ericetorum	0.07	-	-	-	-	+	-	-	-	-	-
Schoenus imberbis	0.14	-	-	-	-	-	-	-	-	-	-
Schoenus lepidosperma subsp. *lepidosperma*	0.28	-	-	-	-	-	-	-	-	-	-
Schoenus lepidosperma subsp. *pachylepis*	0.14	-	-	-	-	-	-	-	S	-	-
Schoenus maschalinus	0.38	-	-	-	-	-	-	-	-	-	-
Schoenus melanostachys	0.62	-	-	-	-	-	-	-	-	-	-
Schoenus moorei	0.07	-	-	-	-	+	-	-	S	-	-
Schoenus nitens	0.07	-	-	-	-	+	-	-	-	-	-
Schoenus turbinatus	0	-	-	-	-	+	-	-	-	-	-
Schoenus villosus	0.03	-	-	-	-	+	-	-	S	+	-
Scirpus polystachyus	0	-	-	-	-	+	-	-	-	-	-
Scleria mackaviensis	0.10	-	-	-	-	+	-	-	S	+	-
Tetraria capillaris	0.17	-	-	-	-	-	-	-	-	-	-
Tricostularia pauciflora	0	-	-	-	-	+	-	-	-	-	-
Uncinia nemoralis	0	-	-	-	-	+	-	-	-	-	-
Uncinia tenella	0.03	-	-	-	-	+	-	-	-	-	-
Haemodoraceae											
Haemodorum planifolium	0	-	-	-	-	+	-	-	S	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Hydrocharitaceae											
Halophila ovalis	0	-	-	-	-	-	-	-	-	-	-
Ottelia ovalifolia	0	-	-	-	-	+	-	-	-	-	-
Vallisneria gigantea	0.03	-	-	-	-	-	-	-	-	-	-
Hypoxidaceae											
Hypoxis hygrometrica var. *hygrometrica*	0.41	-	-	-	-	-	-	-	-	-	-
Hypoxis hygrometrica var. *villosisepala*	0.41	-	-	-	-	-	-	-	-	-	-
Iridaceae											
Diplarrena moraea	0.96	-	-	-	-	-	-	-	-	-	-
Libertia paniculata	1.27	-	-	-	-	-	-	-	-	-	-
Patersonia fragilis	1.48	-	-	-	-	-	-	-	-	-	-
Patersonia glabrata	4.71	-	-	-	-	-	-	-	-	-	-
Patersonia longifolia	0.52	-	-	-	-	-	-	-	-	-	-
Patersonia sericea	1.20	-	-	-	-	-	-	-	-	-	-
Patersonia sp. aff. *fragilis*	0.21	-	-	-	-	-	-	-	-	-	-
Juncaceae											
Juncus alexandri subsp. *alexandri*	0.10	-	-	-	-	-	-	-	-	-	-
Juncus australis	0.34	-	-	-	-	-	-	-	-	-	-
Juncus continuus	0.52	-	-	-	-	-	-	-	-	-	-
Juncus falcatus	0.10	-	-	-	-	-	-	-	-	-	-
Juncus filicaulis	0.10	-	-	-	-	-	-	-	-	-	-
Juncus fockei	0.17	-	-	-	-	-	-	-	-	-	-
Juncus gregiflorus	0.17	-	-	-	-	-	-	-	-	-	-
Juncus homalocaulis	0.03	-	-	-	-	-	-	-	-	-	-
Juncus kraussii subsp. *australiensis*	2.41	-	-	-	-	-	-	-	-	-	-
Juncus pallidus	0.14	-	-	-	-	-	-	-	-	-	-
Juncus pauciflorus	0.58	-	-	-	-	-	-	-	-	-	-
Juncus phaeanthus	0.03	-	-	-	-	-	-	-	-	-	-
Juncus planifolius	1.07	-	-	-	-	-	-	-	-	-	-
Juncus prismatocarpus	0	-	-	-	-	-	-	-	-	-	-
Juncus procerus	0	-	-	-	-	-	-	-	-	-	-
Juncus sandwithii	0.03	-	-	-	-	+	-	-	-	-	-
Juncus sarophorus	0.17	-	-	-	-	-	-	-	-	-	-
Juncus subsecundus	0.28	-	-	-	-	-	-	-	-	-	-
Juncus usitatus	0.69	-	-	-	-	-	-	-	-	-	-
Juncus vaginatus	0.07	-	-	-	-	-	-	-	-	-	-
Luzula densiflora	0.14	-	-	-	-	-	-	-	-	-	-
Luzula flaccida	5.82	-	-	-	-	-	-	-	-	-	-
Luzula meridionalis	0.72	-	-	-	-	-	-	-	-	-	-
Luzula modesta	0	-	-	-	-	+	-	-	-	-	-
Luzula ovata	0.34	-	-	-	-	-	-	-	-	-	-
Juncaginaceae											
Triglochin microtuberosum	0	-	-	-	-	-	-	-	-	-	-
Triglochin procerum	0	-	-	-	-	-	-	-	-	-	-
Triglochin rheophilum	0	-	-	-	-	-	-	-	-	-	-
Triglochin striata	0.52	-	-	-	-	-	-	-	-	-	-
Lomandraceae											
Lomandra confertifolia subsp. *leptostachya*	1.62	-	-	-	-	-	-	-	-	-	-
Lomandra confertifolia subsp. *rubiginosa*	2.31	-	-	-	-	-	-	-	S	-	-
Lomandra confertifolia subsp. *similis*	3.17	-	-	-	-	-	-	-	S	-	-
Lomandra cylindrica	0.28	-	-	-	-	-	-	-	-	-	-
Lomandra filiformis subsp. *coriacea*	1.58	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Lomandraceae cont.											
Lomandra filiformis subsp. *filiformis*	5.99	-	-	-	-	-	-	-	-	-	-
Lomandra filiformis subsp. *flavior*	0.96	-	-	-	-	-	-	-	-	-	-
Lomandra glauca	4.96	-	-	-	-	-	-	-	-	-	-
Lomandra longifolia subsp. *exilis*	0.96	-	-	-	-	-	-	-	-	-	-
Lomandra longifolia subsp. *longifolia*	50.17	-	-	-	-	-	-	-	-	-	-
Lomandra multiflora subsp. *multiflora*	23.71	-	-	-	-	-	-	-	-	-	-
Luzuriagaceae											
Drymophila cyanocarpa	1.27	-	-	-	-	-	-	-	-	-	-
Eustrephus latifolius	16.00	-	-	-	-	-	-	-	-	-	-
Geitonoplesium cymosum	11.80	-	-	-	-	-	-	-	-	-	-
Orchidaceae											
Acianthus caudatus	0	-	-	-	-	-	-	-	-	-	-
Acianthus exsertus	0.38	-	-	-	-	-	-	-	-	-	-
Acianthus fornicatus	0	-	-	-	-	-	-	-	S	-	-
Acianthus pusillus	0	-	-	-	-	-	-	-	-	-	-
Arthrochilus huntianus	0	-	-	-	-	-	-	-	-	-	-
Burnettia cuneata	0	-	-	+	-	-	-	-	-	+	-
Caladenia caerulea	0	-	-	-	-	-	-	-	-	-	-
Caladenia carnea var. *carnea*	0.10	-	-	-	-	-	-	-	-	-	-
Caladenia catenata	0.45	-	-	-	-	-	-	-	-	-	-
Caladenia clarkiae	0	-	-	+	-	-	-	-	-	-	-
Caladenia congesta	0	-	-	-	-	+	-	-	-	-	-
Caladenia deformis	0	-	-	-	-	+	-	-	-	-	-
Caladenia gracilis	0	-	-	-	-	+	-	-	-	-	-
Caladenia hildae	0	-	-	-	-	+	-	-	-	-	-
Caladenia picta	0	-	-	-	-	+	-	-	-	-	-
Caladenia pusilla	0	-	-	+	-	-	-	-	-	-	-
Caladenia testacea	0	-	-	-	-	+	-	-	-	-	-
Caladenia tesselata	0	-	+	-	-	-	-	-	-	-	-
Caladenia sp. aff. *reticulata*	0	-	-	+	+	-	-	-	N	-	-
Caleana major	0.10	-	-	-	-	-	-	-	-	-	-
Caleana minor	0	-	-	-	-	-	-	-	-	-	-
Calochilus campestris	0.03	-	-	-	-	-	-	-	-	-	-
Calochilus gracillimus	0	-	-	-	-	+	-	-	-	-	-
Calochilus paludosus	0	-	-	-	-	-	-	-	-	-	-
Calochilus robertsonii	0.10	-	-	-	-	-	-	-	-	-	-
Chiloglottis pluricallata	0.14	-	-	-	-	-	-	-	S	-	-
Chiloglottis reflexa	0.07	-	-	-	-	-	-	-	-	-	-
Chiloglottis turfosa	0	-	-	-	-	-	-	-	-	-	-
Corybas aconitiflorus	0	-	-	-	-	+	-	-	-	-	-
Corybas fimbriatus	0	-	-	-	-	-	-	-	-	-	-
Corybas fordhamii	0	-	-	-	-	+	-	-	-	-	-
Corybas unguiculatus	0	-	-	-	-	-	-	-	-	-	-
Cryptostylis erecta	0.03	-	-	-	-	+	-	-	-	-	-
Cryptostylis hunteriana	0	-	+	-	-	-	-	-	-	-	-
Cryptostylis leptochila	0.14	-	-	-	-	-	-	-	-	-	-
Cryptostylis subulata	0.28	-	-	-	-	-	-	-	-	-	-
Cymbidium suave	0.93	-	-	-	-	-	-	-	S	-	-
Cyrtostylis reniformis	0	-	-	-	-	-	-	-	-	-	-
Dendrobium aemulum	0	-	-	-	-	+	-	-	S	-	-
Dendrobium pugioniforme	0.07	-	-	-	-	+	-	-	S	-	-
Dendrobium speciosum	1.62	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Orchidaceae cont.											
Dendrobium striolatum	1.03	-	-	-	-	-	-	-	-	-	-
Dipodium punctatum	1.51	-	-	-	-	-	-	-	-	-	-
Dipodium roseum	0	-	-	-	-	-	-	-	-	-	-
Diuris corymbosa	0	-	-	-	-	+	-	-	N	-	-
Diuris lanceolata	0	-	-	-	-	-	-	-	-	-	-
Diuris ochroma	0	-	+	-	-	-	-	-	-	-	-
Diuris pardina	0.03	-	-	-	-	-	-	-	-	-	-
Diuris pedunculata	0	-	+	-	-	-	-	-	-	-	-
Diuris punctata var. *punctata*	0	-	-	-	-	-	-	-	-	-	-
Diuris sulphurea	0.10	-	-	-	-	-	-	-	-	-	-
Eriochilus cucullatus	0.21	-	-	-	-	-	-	-	-	-	-
Gastrodia sesamoides	0	-	-	-	-	-	-	-	-	-	-
Genoplesium archeri	0	-	-	-	-	-	-	-	-	-	-
Genoplesium nudiscapum	0	-	-	-	-	+	-	-	-	-	-
Genoplesium nudum	0	-	-	-	-	-	-	-	-	-	-
Genoplesium rhyoliticum	0.03	+	+	-	-	-	-	-	-	-	-
Glossodia major	0.21	-	-	-	-	-	-	-	-	-	-
Glossodia minor	0	-	-	-	-	-	-	-	-	-	-
Liparis reflexa	0.03	-	-	-	-	+	-	-	S	-	-
Lyperanthus nigricans	0	-	-	-	-	-	-	-	-	-	-
Lyperanthus suaveolens	0	-	-	-	-	+	-	-	-	-	-
Microtis parviflora	0.03	-	-	-	-	-	-	-	-	-	-
Microtis rara	0	-	-	-	-	+	-	-	-	-	-
Microtis unifolia	0	-	-	-	-	-	-	-	-	-	-
Orthoceras strictum	0	-	-	-	-	+	-	-	-	-	-
Plectorrhiza tridentata	0.10	-	-	-	-	-	-	-	-	-	-
Prasophyllum affine	0	-	+	-	-	-	-	-	-	-	-
Prasophyllum appendiculatum	0	-	-	-	-	+	-	-	-	-	-
Prasophyllum brevilabre	0	-	-	-	-	-	-	-	-	-	-
Prasophyllum elatum	0	-	-	-	-	-	-	-	-	-	-
Prasophyllum flavum	0	-	-	+	-	-	-	-	-	-	-
Prasophyllum sp. aff. *fitzgeraldii*	0	-	-	-	-	+	-	-	-	-	-
Pterostylis alata	0	-	-	-	-	+	-	-	-	-	-
Pterostylis alpina	0	-	-	-	-	+	-	-	-	-	-
Pterostylis concinna	0	-	-	-	-	-	-	-	-	-	-
Pterostylis curta	0	-	-	-	-	-	-	-	-	-	-
Pterostylis decurva	0.14	-	-	-	-	-	-	-	-	-	-
Pterostylis furcata	0	-	-	-	-	+	-	-	-	-	-
Pterostylis longifolia	0.24	-	-	-	-	-	-	-	-	-	-
Pterostylis nutans	0.10	-	-	-	-	-	-	-	-	-	-
Pterostylis obtusa	0.03	-	-	-	-	+	-	-	-	-	-
Pterostylis parviflora	0.21	-	-	-	-	-	-	-	-	-	-
Pterostylis pedoglossa	0	-	-	-	-	+	-	-	-	-	-
Pterostylis pedunculata	0	-	-	-	-	-	-	-	-	-	-
Pterostylis plumosa	0	-	-	-	-	+	-	-	-	+	+
Pterostylis reflexa	0	-	-	-	-	+	-	-	S	-	-
Pterostylis revoluta	0	-	-	-	-	+	-	-	-	-	-
Pterostylis sp. aff. *rufa*	0	-	-	-	-	+	-	-	-	-	-
Sarcochilus australis	0.03	-	-	-	-	-	-	+	-	-	-
Sarcochilus falcatus	0.14	-	-	-	-	-	-	-	-	-	-
Sarcochilus hillii	0.03	-	-	-	-	+	-	+	S	-	-
Sarcochilus olivaceus	0	-	-	-	-	+	-	+	S	-	-
Spiranthes sinensis subsp. *australis*	0	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Orchidaceae cont.											
Thelymitra carnea	0	-	-	-	-	-	-	-	-	-	-
Thelymitra cyanea	0.03	-	-	-	-	+	-	-	-	-	-
Thelymitra ixioides var. *ixioides*	0	-	-	-	-	-	-	-	-	-	-
Thelymitra media var. *media*	0	-	-	-	-	-	-	-	-	-	-
Thelymitra nuda	0	-	-	-	-	+	-	-	-	-	-
Thelymitra pauciflora	0.34	-	-	-	-	-	-	-	-	-	-
Phormiaceae											
Dianella caerulea	28.77	-	-	-	-	-	-	-	-	-	-
Dianella congesta	0	-	-	-	-	+	-	-	S	-	-
Dianella longifolia var. *longifolia*	0.86	-	-	-	-	-	-	-	-	-	-
Dianella revoluta var. *revoluta*	6.78	-	-	-	-	-	-	-	-	-	-
Dianella tasmanica	16.38	-	-	-	-	-	-	-	-	-	-
Stypandra glauca	2.75	-	-	-	-	-	-	-	-	-	-
Thelionema caespitosum	0.65	-	-	-	-	-	-	-	-	-	-
Thelionema umbellatum	0.10	-	-	-	-	+	-	-	-	-	-
Phylidraceae											
Philydrum lanuginosum	0	-	-	-	-	+	-	-	-	-	-
Poaceae											
Agrostis aemula	0	-	-	-	-	+	-	-	-	-	-
Agrostis avenacea var. *avenacea*	1.55	-	-	-	-	-	-	-	-	-	-
Agrostis billardieri	0.07	-	-	-	-	+	-	-	-	-	-
Agrostis sp. aff. *hiemalis*	0	-	-	-	-	+	-	-	-	-	-
Amphibromus nervosus	0	-	-	-	-	+	-	-	-	-	-
Amphipogon strictus var. *strictus*	0.03	-	-	-	-	+	-	-	-	-	-
Anisopogon avenaceus	1.89	-	-	-	-	-	-	-	-	-	-
Aristida jerichoensis var. *jerichoensis*	0	-	-	-	-	+	-	-	S	-	-
Aristida ramosa var. *ramosa*	0.38	-	-	-	-	-	-	-	-	-	-
Aristida vagans	1.51	-	-	-	-	-	-	-	S	-	-
Australopyrum pectinatum	0.03	-	-	-	-	+	-	-	-	-	-
Australopyrum retrofractum	0	-	-	-	-	-	-	-	-	-	-
Austrofestuca eriopoda	0	-	-	-	-	+	-	-	-	-	-
Austrofestuca hookeriana	0.03	-	-	-	-	+	-	-	-	-	-
Austrofestuca littoralis	0.86	-	-	-	-	-	-	-	-	-	-
Austrostipa bigeniculata	0	-	-	-	-	-	-	-	-	-	-
Austrostipa blackii	0.03	-	-	-	-	+	-	-	-	-	-
Austrostipa densiflora	0.03	-	-	-	-	-	-	-	-	-	-
Austrostipa flavescens	0.24	-	-	-	-	-	-	-	-	-	-
Austrostipa mollis	0.03	-	-	-	-	-	-	-	-	-	-
Austrostipa nivicola	0	-	-	-	-	+	-	-	-	-	-
Austrostipa nodosa	0	-	-	-	-	+	-	-	-	-	-
Austrostipa pubescens	0.07	-	-	-	-	-	-	-	S	-	-
Austrostipa pubinodis	0.76	-	-	-	-	-	-	-	-	-	-
Austrostipa ramosissima	0.07	-	-	-	-	-	-	-	S	-	-
Austrostipa rudis subsp. *australis*	0	-	-	-	-	+	-	-	N	-	-
Austrostipa rudis subsp. *nervosa*	4.20	-	-	-	-	-	-	-	-	-	-
Austrostipa rudis subsp. *rudis*	0.24	-	-	-	-	-	-	-	-	-	-
Austrostipa scabra subsp. *falcata*	0.03	-	-	-	-	-	-	-	-	-	-
Austrostipa semibarbata	0.10	-	-	-	-	+	-	-	-	-	-
Austrostipa stipoides	1.20	-	-	-	-	-	-	-	-	-	-
Austrostipa stuposa	0	-	-	-	-	-	-	-	-	-	-
Austrostipa verticillata	0.03	-	-	-	-	-	-	-	S	-	-
Bothriochloa macra	0.07	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.

	Freq. (%)	1	2	3	4	5	5X	6	7	8	9
Poaceae cont.											
Cenchrus caliculatus	0.38	-	-	-	-	-	-	-	S	-	-
Chionochloa pallida	11.63	-	-	-	-	-	-	-	-	-	-
Chloris truncata	0	-	-	-	-	-	-	-	-	-	-
Chloris ventricosa	0.03	-	-	-	-	-	-	-	-	-	-
Cymbopogon refractus	1.14	-	-	-	-	-	-	-	-	-	-
Deschampsia caespitosa	0	-	-	-	-	+	+	-	-	-	-
Deyeuxia accedens	0.07	-	-	+	-	-	-	-	N	-	-
Deyeuxia angustifolia	0	-	-	-	-	+	-	-	S	-	-
Deyeuxia brachyathera	0.03	-	-	-	-	+	-	-	-	-	-
Deyeuxia contracta	0.34	-	-	-	-	-	-	-	-	-	-
Deyeuxia crassiuscula	0.14	-	-	-	-	+	-	-	-	-	-
Deyeuxia gunniana	0.31	-	-	-	-	-	-	-	-	-	-
Deyeuxia microseta	0	-	-	+	-	-	-	-	LN	-	-
Deyeuxia monticola var. *monticola*	1.65	-	-	-	-	-	-	-	-	-	-
Deyeuxia nudiflora	0.03	-	-	-	-	+	-	-	-	-	-
Deyeuxia parviseta var. *boormanii*	0.14	-	-	-	-	-	-	-	-	-	-
Deyeuxia parviseta var. *parviseta*	0.14	-	-	-	-	-	-	-	-	-	-
Deyeuxia quadriseta	2.51	-	-	-	-	-	-	-	-	-	-
Deyeuxia scaberula	0.07	-	-	-	-	+	-	-	-	-	-
Deyeuxia sp. aff. *brachyathera*	0	-	-	-	-	+	-	-	-	-	-
Deyeuxia sp. aff. *crassiuscula*	0	-	-	-	-	+	-	-	-	-	-
Deyeuxia talariata	0	-	-	+	+	-	-	-	S	+	-
Dichanthium sericeum subsp. *sericeum*	0.63								S		
Dichelachne crinita	0.55	-	-	-	-	-	-	-	-	-	-
Dichelachne inaequiglumis	0.17	-	-	-	-	-	-	-	-	-	-
Dichelachne micrantha	4.65	-	-	-	-	-	-	-	-	-	-
Dichelachne parva	0.10	-	+	-	-	-	-	-	-	-	-
Dichelachne rara	10.87	-	-	-	-	-	-	-	-	-	-
Dichelachne sieberiana	0	-	-	-	-	+	-	-	-	-	-
Digitaria parviflora	0.69	-	-	-	-	-	-	-	-	-	-
Digitaria ramularis	0.76	-	-	-	-	-	-	-	S	-	-
Dryopoa dives	0	-	-	-	-	-	-	-	-	-	-
Echinopogon caespitosus var. *caespitosus*	2.37	-	-	-	-	-	-	-	-	-	-
Echinopogon mckiei	0	-	-	-	-	+	-	-	-	-	-
Echinopogon ovatus	11.08	-	-	-	-	-	-	-	-	-	-
Elymus scaber var. *scaber*	2.34	-	-	-	-	-	-	-	-	-	-
Enneapogon nigricans	0.03	-	-	-	-	+	-	-	-	-	-
Entolasia marginata	5.68	-	-	-	-	-	-	-	-	-	-
Entolasia stricta	19.48	-	-	-	-	-	-	-	-	-	-
Eragrostis benthamii	0	-	-	-	-	+	-	-	-	-	-
Eragrostis leptostachya	2.44	-	-	-	-	-	-	-	-	-	-
Eragrostis parviflora	0										
Eragrostis trachycarpa	0	-	-	-	-	+	-	-	-	-	-
Festuca asperula	0.03	-	-	+	-	-	-	-	-	-	-
Glyceria australis	0	-	-	-	-	+	-	-	-	-	-
Hemarthria uncinata var. *uncinata*	0.10	-	-	-	-	-	-	-	-	-	-
Hierochloe rariflora	12.46	-	-	-	-	-	-	-	-	-	-
Imperata cylindrica var. *major*	6.54	-	-	-	-	-	-	-	-	-	-
Isachne globosa	0.17	-	-	+	-	-	-	-	-	-	-
Microlaena stipoides var. *stipoides*	23.54	-	-	-	-	-	-	-	-	-	-
Notodanthonia caespitosa	0.07	-	-	-	-	-	-	-	-	-	-
Notodanthonia eriantha	0.03	-	-	-	-	+	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Poaceae cont.											
Notodanthonia laevis	0.24	-	-	-	-	-	-	-	-	-	-
Notodanthonia linkii var. *fulva*	0	-	-	-	-	-	-	-	-	-	-
Notodanthonia monticola	0.10	-	-	-	-	-	-	-	-	-	-
Notodanthonia penicillata	0.24	-	-	-	-	-	-	-	-	-	-
Notodanthonia pilosa var. *pilosa*	3.82	-	-	-	-	-	-	-	-	-	-
Notodanthonia racemosa var. *racemosa*	2.68	-	-	-	-	-	-	-	-	-	-
Notodanthonia setacea	0.10	-	-	-	-	+	-	-	-	-	-
Notodanthonia tenuior	0.58	-	-	-	-	-	-	-	-	-	-
Oplismenus aemulus	1.00	-	-	-	-	-	-	-	-	-	-
Oplismenus imbecillis	10.56	-	-	-	-	-	-	-	-	-	-
Panicum bisulcatum	0	-	-	-	-	+	-	-	-	-	-
Panicum simile	0.83	-	-	-	-	-	-	-	-	-	-
Paspalum distichum	0.03	-	-	-	-	-	-	-	-	-	-
Paspalum orbiculare	0.03	-	-	-	-	+	-	-	-	-	-
Pentapogon quadrifidus	0.03	-	-	-	-	+	-	-	-	-	-
Phragmites australis	0.89	-	-	-	-	-	-	-	-	-	-
Plinthanthesis paradoxa	0.28	-	-	-	-	-	-	-	-	-	-
Poa affinis	0.38	-	-	-	-	+	-	-	S	-	-
Poa cheelii	0.14	-	-	-	-	-	-	-	S	-	-
Poa clivicola	0.48	-	-	-	-	-	-	-	-	-	-
Poa costiniana	0.10	-	-	-	-	-	-	-	-	-	-
Poa ensiformis	4.71	-	-	-	-	-	-	-	-	-	-
Poa helmsii	0.07	-	-	-	-	-	-	-	-	-	-
Poa labillardieri	15.62	-	-	-	-	-	-	-	-	-	-
Poa meionectes	44.67	-	-	-	-	-	-	-	-	-	-
Poa poiformis	0.31	-	-	-	-	-	-	-	-	-	-
Poa queenslandica	0	-	-	-	-	+	-	-	S	-	-
Poa sieberiana var. *cyanophylla*	0.07	-	-	-	-	-	-	-	-	-	-
Poa sieberiana var. *hirtella*	0	-	-	-	-	+	-	-	-	-	-
Poa sieberiana var. *sieberiana*	1.24	-	-	-	-	-	-	-	-	-	-
Poa tenera	0.38	-	-	-	-	-	-	-	-	-	-
Sorghum leiocladum	0.24	-	-	-	-	-	-	-	-	-	-
Spinifex sericeus	1.65	-	-	-	-	-	-	-	-	-	-
Sporobolus creber	0.55	-	-	-	-	-	-	-	-	-	-
Sporobolus elongatus	0	-	-	-	-	+	-	-	S	-	-
Sporobolus virginicus	1.82	-	-	-	-	-	-	-	-	-	-
Tetrarrhena acuminata	0	-	-	+	-	-	-	-	N	-	-
Tetrarrhena juncea	10.81	-	-	-	-	-	-	-	-	-	-
Tetrarrhena turfosa	0.21	-	-	-	-	+	-	-	-	-	-
Themeda australis	10.70	-	-	-	-	-	-	-	-	-	-
Thonandia longifolia	7.57	-	-	-	-	-	-	-	-	-	-
Thonandia semiannularis	0	-	-	-	-	-	-	-	-	-	-
Tripogon loliiformis	0	-	-	-	-	+	-	-	-	-	-
Trisetum spicatum	0.03	-	-	-	-	+	-	-	-	-	-
Zoysia macrantha	1.58	-	-	-	-	-	-	-	-	-	-
Posidoniaceae											
Posidonia australis	0	-	-	-	-	-	-	-	-	-	-
Potamogetonaceae											
Potamogeton crispus	0	-	-	-	-	+	-	-	-	-	-
Potamogeton ochreatus	0	-	-	-	-	-	-	-	-	-	-
Potamogeton tricarinatus	0.03	-	-	-	-	-	-	-	-	-	-
Ruppia polycarpa	0	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Restionaceae											
Baloskion australe	0.41	-	-	-	-	-	-	-	-	-	-
Baloskion tetraphyllum subsp. *tetraphyllum*	0	-	-	-	-	+	-	-	N	-	-
Calorophus elongatus	0	-	-	-	-	+	-	-	N	-	-
Empodisma minus	1.55	-	-	-	-	-	-	-	-	-	-
Eurychorda complanata	0.21	-	-	-	-	-	-	-	-	-	-
Hypolaena fastigiata	0.69	-	-	-	-	-	-	-	-	-	-
Leptocarpus tenax	0.69	-	-	-	-	-	-	-	-	-	-
Lepyrodia anarthria	0.41	-	-	-	-	-	-	-	-	-	-
Lepyrodia muelleri	0	-	-	-	-	+	-	-	-	-	-
Lepyrodia scariosa	0.45	-	-	-	-	-	-	-	S	-	-
Lepyrodia verruculosa	0	-	-	-	-	-	-	-	S	-	-
Ripogonaceae											
Ripogonum album	0.34	-	-	-	-	-	-	-	-	-	-
Smilacaceae											
Smilax australis	17.52	-	-	-	-	-	-	-	-	-	-
Smilax glyciphylla	0	-	-	-	-	+	-	-	S	-	-
Sparganiaceae											
Sparganium subglobosum	0	-	-	+	-	-	-	-	-	-	-
Typhaceae											
Typha domingensis	0	-	-	-	-	+	-	-	-	-	-
Typha orientalis	0	-	-	-	-	-	-	-	-	-	-
Uvulariaceae											
Schelhammera undulata	5.99	-	-	-	-	-	-	-	-	-	-
Xanthorrhoeaceae											
Xanthorrhoea australis	2.51	-	-	-	-	-	-	-	-	-	-
Xanthorrhoea concava	3.96	-	-	-	-	-	-	-	S	-	-
Xanthorrhoea minor subsp. *lutea*	0.03	-	-	-	-	+	-	-	N	-	-
Xanthorrhoea resinifera	0.86	-	-	-	-	-	-	-	-	-	-
Xyridaceae											
Xyris gracilis subsp. *gracilis*	0.45	-	-	-	-	-	-	-	LN	-	-
Xyris operculata	0.69	-	-	-	-	-	-	-	-	-	-
Zannichelliaceae											
Lepilaena bilocularis	0	-	-	-	-	-	-	-	-	-	-
Zosteraceae											
Zostera capricorni	0	-	-	-	-	-	-	-	-	-	-
Zostera muelleri	0	-	-	-	-	-	-	-	-	-	-
MAGNOLIOPSIDA (MAGNOLIIDAE)											
Acanthaceae											
Brunoniella pumilio	0.21	-	-	-	-	-	-	-	-	-	-
Pseuderanthemum variabile	0.96	-	-	-	-	-	-	-	S	-	-
Aizoaceae											
Carpobrotus glaucescens	1.65	-	-	-	-	-	-	-	-	-	-
Disphyma crassifolium subsp. *clavellatum*	0.38	-	-	-	-	+	-	-	-	-	-
Tetragonia tetragonoides	0.41	-	-	-	-	-	-	-	-	-	-
Amaranthaceae											
Alternanthera denticulata	0.10	-	-	-	-	+	-	-	-	-	-
Deeringia amaranthoides	0.21	-	-	-	-	-	-	-	S	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Apiaceae											
Actinotus gibbonsii	0	-	-	+	-	-	-	-	S	+	-
Actinotus helianthi	0	-	-	-	-	+	-	-	S	-	-
Apium prostratum subsp. *prostratum* var. *filiforme*	0.03	-	-	-	-	+	-	-	-	-	-
Apium prostratum subsp. *prostratum* var. *prostratum*	0.79	-	-	-	-	-	-	-	-	-	-
Centella asiatica	0.58	-	-	-	-	-	-	-	-	-	-
Centella cordifolia	0.10	-	-	-	-	+	-	-	-	-	-
Daucus glochidiatus	0.93	-	-	-	-	-	-	-	-	-	-
Eryngium rostratum	0	-	-	-	-	+	+	+	-	-	-
Hydrocotyle acutiloba	10.87	-	-	-	-	-	-	-	-	-	-
Hydrocotyle algida	0.03	-	-	-	-	+	-	-	-	-	-
Hydrocotyle geraniifolia	0.96	-	-	-	-	-	-	-	-	-	-
Hydrocotyle laxiflora	15.28	-	-	-	-	-	-	-	-	-	-
Hydrocotyle peduncularis	1.07	-	-	-	-	-	-	-	-	-	-
Hydrocotyle tripartita	1.14	-	-	-	-	-	-	-	-	-	-
Lilaeopsis polyantha	0.17	-	-	-	-	-	-	-	-	-	-
Oreomyrrhis ciliata	0.14	-	-	-	-	-	-	-	-	-	-
Oreomyrrhis eriopoda	0.38	-	-	-	-	-	-	-	-	-	-
Platysace ericoides	0.03	-	-	-	-	-	-	-	-	-	-
Platysace heterophylla	0.03	-	-	-	-	+	-	-	N	-	-
Platysace lanceolata	29.94	-	-	-	-	-	-	-	-	-	-
Trachymene anisocarpa	0	-	-	-	-	+	-	-	-	-	-
Trachymene humilis subsp. *humilis*	0.10	-	-	-	-	+	-	-	-	-	-
Xanthosia atkinsoniana	0.38	-	-	-	-	-	-	-	S	-	-
Xanthosia dissecta	0.31	-	-	-	-	-	-	-	-	-	-
Xanthosia pilosa	4.40	-	-	-	-	-	-	-	-	-	-
Xanthosia pusilla	0.14	-	-	-	-	-	-	-	N	-	-
Xanthosia ternifolia	0	-	-	-	-	+	-	-	-	-	-
Xanthosia tridentata	1.27	-	-	-	-	-	-	-	-	-	-
Apocynaceae											
Alyxia buxifolia	0.17	-	-	-	-	-	-	-	-	-	-
Parsonsia brownii	2.00	-	-	-	-	-	-	-	-	-	-
Parsonsia straminea	0.55	-	-	-	-	-	-	-	S	-	-
Araliaceae											
Astrotricha latifolia	0.07	-	-	-	-	+	-	-	-	-	-
Astrotricha ledifolia	0	-	-	-	-	+	-	-	-	-	-
Astrotricha sp. 'Nadgee'	0	+	-	+	-	-	-	-	-	-	-
Astrotricha sp. 'Wallagaraugh'	0	-	-	+	-	-	-	-	N	-	-
Polyscias murrayi	0.31	-	-	-	-	-	-	-	-	-	-
Polyscias sambucifolia subsp. A	7.09	-	-	-	-	-	-	-	-	-	-
Polyscias sambucifolia subsp. C	7.09	-	-	-	-	-	-	-	-	-	-
Asclepiadaceae											
Marsdenia flavescens	0.52	-	-	-	-	-	-	-	-	-	-
Marsdenia rostrata	9.15	-	-	-	-	-	-	-	-	-	-
Marsdenia suaveolens	1.07	-	-	-	-	-	-	-	S	-	-
Tylophora barbata	22.75	-	-	-	-	-	-	-	-	-	-
Asteraceae											
Actites megalocarpa	0.76	-	-	-	-	-	-	-	-	-	-
Ammobium alatum	0	-	-	-	-	+	+	-	-	-	-
Apalochlamys spectabilis	0.07	-	-	-	-	+	-	-	N	-	-
Argentipallium obtusifolium	0.21	-	-	-	-	-	-	-	N	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Asteraceae cont.											
Arrhenechthites mixta	1.86	-	-	-	-	-	-	-	-	-	-
Bedfordia arborescens	11.22	-	-	-	-	-	-	-	-	-	-
Brachycome aculeata	0.28	-	-	-	-	-	-	-	-	-	-
Brachycome angustifolia var. *angustifolia*	0	-	-	-	-	+	-	-	-	-	-
Brachycome angustifolia var. *heterophylla*	0.86	-	-	-	-	-	-	-	-	-	-
Brachycome cardiocarpa	0.17	-	-	-	-	-	-	-	-	-	-
Brachycome ciliaris var. *ciliaris*	0.10	-	-	-	-	+	-	-	-	-	-
Brachycome decipiens	0.14	-	-	-	-	-	-	-	-	-	-
Brachycome graminea	0	-	-	-	-	+	-	-	-	-	-
Brachycome obovata	0	-	-	-	-	+	-	-	-	-	-
Brachycome radicans	0	-	-	-	-	+	-	-	-	-	-
Brachycome rigidula	0	-	-	-	-	+	-	-	-	-	-
Brachycome scapigera	0.17	-	-	-	-	+	-	-	-	-	-
Brachycome spathulata	0.07	-	-	-	-	+	-	-	-	-	-
Bracteantha bracteata species complex	4.78	-	-	-	-	-	-	-	-	-	-
Bracteantha subundulata	0.07	-	-	-	-	+	-	-	-	-	+
Bracteantha viscosa	0.03	-	-	-	-	+	-	-	-	-	-
Calocephalus lacteus	0	-	-	-	-	+	-	-	N	-	-
Calomeria amaranthoides	0.31	-	-	-	-	-	-	-	-	-	-
Calotis glandulosa	0	-	+	-	-	-	-	-	S	-	-
Calotis lappulacea	0.10	-	-	-	-	+	-	-	-	-	-
Cassinia aculeata	11.84	-	-	-	-	-	-	-	-	-	-
Cassinia aureonitens	0	-	-	-	-	+	-	-	S	+	-
Cassinia cunninghamii	0	-	-	-	-	+	-	-	S	+	-
Cassinia longifolia	13.08	-	-	-	-	-	-	-	-	-	-
Cassinia trinerva	7.78	-	-	-	-	-	-	-	-	-	-
Cassinia uncata	0	-	-	-	-	+	-	-	-	-	-
Celmisia sp. (*pulchella* ms)	0.03	-	-	-	-	+	-	-	-	-	-
Centipeda minima var. *minima*	0.17	-	-	-	-	-	-	-	-	-	-
Chrysocephalum apiculatum	0.31	-	-	-	-	-	-	-	-	-	-
Chrysocephalum baxteri	0.31	-	-	-	-	-	-	-	N	-	-
Chrysocephalum semipapposum	0.65	-	-	-	-	-	-	-	-	-	-
Cotula alpina	0.10	-	-	-	-	+	-	-	-	-	-
Cotula australis	0.38	-	-	-	-	-	-	-	-	-	-
Craspedia canens	0.43	-	-	-	-	-	-	-	-	-	-
Craspedia paludicola	0	-	-	-	-	+	-	-	-	-	-
Craspedia variabilis	0.14	-	-	-	-	-	-	-	-	-	-
Cymbonotus lawsonianus	0	-	-	-	-	+	-	-	-	-	-
Cymbonotus preissianus	1.79	-	-	-	-	-	-	-	-	-	-
Euchiton sphaericus	0.93	-	-	-	-	-	-	-	-	-	-
Gnaphalium gymnocephalum	10.84	-	-	-	-	-	-	-	-	-	-
Gnaphalium involucratum	0.69	-	-	-	-	-	-	-	-	-	-
Gnaphalium spicatum	0.03	-	-	-	-	+	-	-	-	-	-
Helichrysum collinum	0.03	-	-	-	-	+	-	-	S	+	-
Helichrysum elatum	3.54	-	-	-	-	-	-	-	-	-	-
Helichrysum leucopsideum	0.62	-	-	-	-	-	-	-	-	-	-
Helichrysum rutidolepis	0.89	-	-	-	-	-	-	-	-	-	-
Helichrysum scorpioides	9.08	-	-	-	-	-	-	-	-	-	-
Lagenifera gracilis	0.24	-	-	-	-	-	-	-	-	-	-
Lagenifera stipitata	24.60	-	-	-	-	-	-	-	-	-	-
Leptinella filicula	1.34	-	-	-	-	-	-	-	-	-	-
Leptinella longipes	0.07	-	-	-	-	+	-	-	-	-	-
Leptorhynchos nitidulus	0.10	-	-	-	-	+	-	-	-	-	-

Appendix 1 cont.

	Freq. (%)	1	2	3	4	5	5X	6	7	8	9
Asteraceae cont.											
Leptorhynchos squamatus subsp. A	0.10	-	-	-	-	+	-	-	-	-	-
Leucochrysum albicans subsp. *albicans*	0	-	-	-	-	+	-	-	-	-	-
Microseris lanceolata	0	-	-	-	-	-	-	+	-	-	-
Olearia alpicola	0.07	-	-	-	-	+	-	-	-	-	-
Olearia argophylla	7.78	-	-	-	-	-	-	-	-	-	-
Olearia axillaris	0.14	-	-	-	-	+	-	-	-	-	-
Olearia erubescens	5.75	-	-	-	-	-	-	-	-	-	-
Olearia glandulosa	0.17	-	-	-	-	-	-	-	-	-	-
Olearia iodochroa	0.41	-	-	-	-	-	-	-	-	-	-
Olearia megalophylla	1.14	-	-	-	-	-	-	-	-	-	-
Olearia myrsinoides	0.52	-	-	-	-	-	-	-	-	-	-
Olearia phlogopappa	0.79	-	-	-	-	-	-	-	-	-	-
Olearia ramulosa subsp. D	0.62	-	-	-	-	-	-	-	-	-	-
Olearia rugosa	0	-	-	-	-	+	-	-	N	-	-
Olearia stellulata	3.48	-	-	-	-	-	-	-	-	-	-
Olearia tomentosa	0.83	-	-	-	-	-	-	-	S	-	-
Ozothamnus argophyllus	5.30	-	-	-	-	-	-	-	-	-	-
Ozothamnus conditus	0.17	-	-	-	-	+	-	-	-	-	-
Ozothamnus cuneifolius	4.78	-	-	-	-	-	-	-	-	-	-
Ozothamnus diosmifolius	9.19	-	-	-	-	-	-	-	S	-	-
Ozothamnus ferrugineus	3.27	-	-	-	-	-	-	-	-	-	-
Ozothamnus obcordatus subsp. *major*	1.24	-	-	-	-	-	-	-	-	-	-
Ozothamnus rosmarinifolius	0.31	-	-	-	-	-	-	-	LN	-	-
Ozothamnus thyrsoideus	0.41	-	-	-	-	-	-	-	-	-	-
Ozothamnus turbinatus	0	-	-	-	-	+	-	-	N	-	-
Picris angustifolia subsp. *angustifolia*	0.62	-	-	-	-	-	-	-	-	-	-
Podolepis hieracioides	0.14	-	-	-	-	-	-	-	-	-	-
Podolepis jaceoides	0.03	-	-	-	-	+	-	-	-	-	-
Pseudognaphalium luteoalbum	0.55	-	-	-	-	-	-	-	-	-	-
Rutidosis leiolepis	0	-	+	-	-	-	-	-	-	-	-
Senecio bipinnatisectus	0.21	-	-	-	-	-	-	-	S	-	-
Senecio biserratus	0.10	-	-	-	-	+	-	-	-	-	-
Senecio diaschides	0.03	-	-	-	-	-	-	-	-	-	-
Senecio glomeratus	1.27	-	-	-	-	-	-	-	S	-	-
Senecio hispidulus var. *dissectus*	0.17	-	-	-	-	-	-	-	-	-	-
Senecio hispidulus var. *hispidulus*	1.31	-	-	-	-	-	-	-	-	-	-
Senecio lautus subsp. *dissectifolius*	0	-	-	-	-	+	-	-	-	-	-
Senecio lautus subsp. *maritimus*	0.72	-	-	-	-	-	-	-	-	-	-
Senecio linearifolius	18.58	-	-	-	-	-	-	-	-	-	-
Senecio minimus	2.62	-	-	-	-	-	-	-	-	-	-
Senecio quadridentatus	0.83	-	-	-	-	-	-	-	-	-	-
Senecio spathulatus	0	-	+	-	-	-	-	-	-	-	-
Senecio sp. E	13.39	-	-	-	-	-	-	-	-	-	-
Senecio squarrosus	0	-	+	-	-	-	-	-	N	-	-
Senecio tenuiflorus	0	-	-	-	-	-	-	-	-	-	-
Senecio velleioides	3.23	-	-	-	-	-	-	-	-	-	-
Sigesbeckia orientalis subsp. *orientalis*	5.64	-	-	-	-	-	-	-	-	-	-
Solenogyne gunnii	0.07	-	-	-	-	+	-	-	-	-	-
Sonchus hygrophilus	0	-	-	-	-	+	-	-	S	-	-
Triptilodiscus pygmaeus	0	-	-	-	-	+	-	-	-	-	-
Vernonia cinerea var. *cinerea*	3.92	-	-	-	-	-	-	-	S	-	-
Vittadinia dissecta	0.03	-	-	-	-	+	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**B**	**9**
Asteraceae cont.											
Vittadinia cuneata var. *cuneata* forma *cuneata*	0	-	-	-	-	+	-	-	-	-	-
Vittadinia cuneata var. *cuneata* forma *minor*	0.24	-	-	-	-	-	-	-	-	-	-
Vittadinia muelleri	0.03	-	-	-	-	+	-	-	-	-	-
Vittadinia tenuissima	0.07	-	-	-	-	+	-	-	-	-	-
Avicenniaceae											
Avicennia marina var. *australasica*	1.03	-	-	-	-	-	-	-	-	-	-
Baueraceae											
Bauera rubioides	0.17	-	-	-	-	-	-	-	-	-	-
Bignoniaceae											
Pandorea pandorana	13.04	-	-	-	-	-	-	-	-	-	-
Boraginaceae											
Austrocynoglossum latifolium	1.27	-	-	-	-	-	-	-	-	-	-
Cynoglossum australe	1.96	-	-	-	-	-	-	-	-	-	-
Cynoglossum suaveolens	0.79	-	-	-	-	-	-	-	-	-	-
Ehretia acuminata var. *acuminata*	0.10	-	-	-	-	-	-	-	S	-	-
Myosotis australis	0.24	-	-	-	-	-	-	-	-	-	-
Brassicaceae											
Cardamine gunnii	0.07	-	-	-	-	+	-	-	-	-	-
Cardamine lilacina	0.10	-	-	-	-	+	-	-	-	-	-
Cardamine microthrix	0	-	-	-	-	+	-	-	-	-	-
Cardamine papillata	0	-	-	-	-	+	-	-	-	-	-
Cardamine paucijuga	0.21	-	-	-	-	-	-	-	-	-	-
Cardamine sp. A1	0	-	-	-	-	+	-	-	-	-	-
Lepidium hyssopifolium	0.03	-	+	-	-	-	-	-	-	-	-
Lepidium pseudotasmanicum	0	-	-	+	-	-	-	-	-	-	-
Rorippa dictyosperma	0	-	-	-	-	+	-	-	-	-	-
Rorippa gigantea	0.24	-	-	-	-	-	-	-	-	-	-
Callitrichaceae											
Callitriche muelleri	0.07	-	-	-	-	+	-	-	-	-	-
Campanulaceae											
Wahlenbergia communis	0.72	-	-	-	-	-	-	-	-	-	-
Wahlenbergia gloriosa	0.14	-	-	-	-	+	-	-	-	-	-
Wahlenbergia gracilis	8.60	-	-	-	-	-	-	-	-	-	-
Wahlenbergia littoricola	0.38	-	-	-	-	-	-	-	-	-	-
Wahlenbergia luteola	0	-	-	-	-	+	-	-	-	-	-
Wahlenbergia multicaulis	0	-	-	-	-	+	-	-	-	-	-
Wahlenbergia planiflora subsp. *planiflora*	0.07	-	-	-	-	+	-	-	-	-	-
Wahlenbergia stricta subsp. *stricta*	4.40	-	-	-	-	-	-	-	-	-	-
Caryophyllaceae											
Scleranthus biflorus	1.17	-	-	-	-	-	-	-	-	-	-
Scleranthus diander	0.03	-	-	-	-	+	-	-	-	-	-
Spergularia sp. B	0	-	-	-	-	+	-	-	-	-	-
Stellaria angustifolia	0.14	-	-	-	-	-	-	-	-	-	-
Stellaria flaccida	14.97	-	-	-	-	-	-	-	-	-	-
Stellaria multiflora	0	-	-	+	-	-	-	-	-	-	-
Stellaria pungens	5.13	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Casuarinaceae											
Allocasuarina diminuta subsp. *annectens*	0	-	-	-	-	+	-	-	S	+	-
Allocasuarina distyla	0.03	-	-	-	-	+	-	-	S	-	-
Allocasuarina littoralis	20.82	-	-	-	-	-	-	-	-	-	-
Allocasuarina nana	2.06	-	-	-	-	-	-	-	-	-	-
Allocasuarina paludosa	1.65	-	-	-	-	-	-	-	-	-	-
Allocasuarina verticillata	0.28	-	-	-	-	-	-	-	-	-	-
Casuarina cunninghamiana subsp. *cunninghamiana*	0.48	-	-	-	-	-	-	-	S	-	-
Casuarina glauca	0.14	-	-	-	-	-	-	-	S	-	-
Celasteraceae											
Celastrus australis	0.76	-	-	-	-	-	-	-	-	-	-
Celastrus subspicata	0	-	-	-	-	+	-	-	S	+	-
Chenopodiaceae											
Atriplex australasica	0.48	-	-	-	-	-	-	-	-	-	-
Atriplex cinerea	0	-	-	-	-	+	-	-	-	-	-
Atriplex semibaccata	0	-	-	-	-	+	-	-	-	-	-
Chenopodium carinatum	0.07	-	-	-	-	+	-	-	-	-	-
Chenopodium glaucum	0.07	-	-	-	-	-	-	-	-	-	-
Chenopodium pumilio	0.03	-	-	-	-	+	-	-	-	-	-
Einadia hastata	0.93	-	-	-	-	-	-	-	-	-	-
Einadia nutans subsp. *nutans*	1.24	-	-	-	-	-	-	-	-	-	-
Einadia trigonos subsp. *trigonos*	0.21	-	-	-	-	-	-	-	-	-	-
Enchylaena tomentosa	0	-	-	-	-	+	-	-	-	-	-
Rhagodia candolleana subsp. *candolleana*	1.58	-	-	-	-	-	-	-	-	-	+
Sarcocornia quinqueflora subsp. *quinqueflora*	3.96	-	-	-	-	-	-	-	-	-	-
Sclerostegia arbuscula	0.86	-	-	-	-	-	-	-	-	-	-
Suaeda australis	0.86	-	-	-	-	-	-	-	-	-	-
Chloanthaceae											
Chloanthes parviflora	0.14	-	-	-	-	-	-	-	-	-	-
Clusiaceae											
Hypericum gramineum	17.72	-	-	-	-	-	-	-	-	-	-
Hypericum japonicum	4.16	-	-	-	-	-	-	-	-	-	-
Convolvulaceae											
Calystegia marginata	0.45	-	-	-	-	-	-	-	-	-	-
Calystegia sepium	0	-	-	-	-	+	-	-	-	-	-
Calystegia soldanella	0.52	-	-	-	-	-	-	-	-	-	-
Convolvulus erubescens	0.34	-	-	-	-	-	-	-	-	-	-
Dichondra repens	18.62	-	-	-	-	-	-	-	-	-	-
Polymeria calycina	0	-	-	-	-	+	-	-	S	-	-
Wilsonia backhousei	0.38	-	-	+	-	-	-	-	-	+	-
Crassulaceae											
Crassula helmsii	0	-	-	-	-	+	-	-	-	-	-
Crassula peduncularis	0	-	-	-	-	+	-	-	-	-	-
Crassula sieberiana subsp. *sieberiana*	1.93	-	-	-	-	-	-	-	-	-	-
Cucurbitaceae											
Sicyos australis	0.45	-	-	-	-	+	-	-	-	-	-
Cunoniaceae											
Aphanopetalum resinosum	1.82	-	-	-	-	-	-	-	-	-	-
Schizomeria ovata	0.03	-	-	-	-	+	-	-	S	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Dilleniaceae											
Hibbertia acicularis	0.41	-	-	-	-	-	-	-	-	-	-
Hibbertia aspera	12.08	-	-	-	-	-	-	-	-	-	-
Hibbertia astrotricha	0	-	-	-	-	+	-	-	-	-	-
Hibbertia circumdans	0.31	-	-	-	-	-	-	-	S	-	-
Hibbertia dentata	9.19	-	-	-	-	-	-	-	-	-	-
Hibbertia diffusa	0.96	-	-	-	-	-	-	-	-	-	-
Hibbertia empetrifolia	5.13	-	-	-	-	-	-	-	-	-	-
Hibbertia fasciculata var. *fasciculata*	0.10	-	-	-	-	+	-	-	S	-	-
Hibbertia hermanniifolia	0.10	-	-	+	-	-	-	-	-	-	-
Hibbertia linearis	1.34	-	-	-	-	-	-	-	S	-	-
Hibbertia obtusifolia	8.05	-	-	-	-	-	-	-	-	-	-
Hibbertia pedunculata	0.62	-	-	-	-	-	-	-	-	-	-
Hibbertia prostrata	0	-	-	-	-	+	-	-	-	-	-
Hibbertia riparia	0.17	-	-	-	-	-	-	-	-	-	-
Hibbertia saligna	0.03	-	-	-	-	+	-	-	S	+	-
Hibbertia serpyllifolia	0.24	-	-	-	-	+	-	-	-	-	-
Hibbertia virgata subsp. *virgata*	0.14	-	-	-	-	-	-	-	-	-	-
Hibbertia sp. aff. *hermanniifolia*	0.07	+	-	-	-	+	-	-	-	-	-
Droseraceae											
Drosera auriculata	0.69	-	-	-	-	-	-	-	-	-	-
Drosera binata	0.24	-	-	-	-	-	-	-	-	-	-
Drosera glanduligera	0.03	-	-	-	-	+	-	-	-	-	-
Drosera peltata	0.79	-	-	-	-	-	-	-	-	-	-
Drosera pygmaea	0.10	-	-	-	-	+	-	-	-	-	-
Drosera spathulata	0.28	-	-	-	-	-	-	-	-	-	-
Elaeocarpaceae											
Elaeocarpus holopetalus	1.20	-	-	-	-	-	-	-	-	-	-
Elaeocarpus reticulatus	8.29	-	-	-	-	-	-	-	-	-	-
Elatinaceae											
Elatine gratioloides	0	-	-	-	-	+	-	-	-	-	-
Epacridaceae											
Acrotriche leucocarpa	0.28	-	-	+	-	-	-	-	-	-	-
Acrotriche serrulata	5.85	-	-	-	-	-	-	-	-	-	-
Astroloma humifusum	4.58	-	-	-	-	-	-	-	-	-	-
Astroloma pinifolium	0.03	-	-	-	-	+	-	-	-	-	-
Brachyloma daphnoides subsp. *daphnoides*	3.17	-	-	-	-	-	-	-	-	-	-
Epacris breviflora	0.14	-	-	-	-	-	-	-	-	-	-
Epacris impressa	16.24	-	-	-	-	-	-	-	-	-	-
Epacris lanuginosa	0	-	-	-	-	+	-	-	N	-	-
Epacris microphylla var. *microphylla*	0.93	-	-	-	-	-	-	-	-	-	-
Epacris microphylla var. *rhombifolia*	0.14	-	-	+	-	-	-	-	S	-	-
Epacris obtusifolia	0.48	-	-	-	-	-	-	-	-	-	-
Epacris paludosa	0.76	-	-	-	-	-	-	-	-	-	-
Epacris petrophila	0.03	-	-	-	-	+	-	-	-	-	-
Epacris robusta	0.14	-	-	-	-	+	-	-	S	-	-
Leucopogon attenuatus	0.28	-	-	-	-	+	-	-	-	-	-
Leucopogon collinus	0	-	-	-	-	+	-	-	LN	-	-
Leucopogon ericoides	0.69	-	-	-	-	-	-	-	-	-	-
Leucopogon esquamatus	0.28	-	-	-	-	-	-	-	-	-	-
Leucopogon fletcheri subsp. *brachysepalus*	0	-	-	-	-	+	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Epacridaceae cont.											
Leucopogon fraseri	0.28	-	-	-	-	-	-	-	-	-	-
Leucopogon gelidus	0.38	-	-	-	-	-	-	-	-	-	-
Leucopogon hookeri	0.07	-	-	-	-	+	-	-	-	-	-
Leucopogon juniperinus	3.13	-	-	-	-	-	-	-	-	-	-
Leucopogon lanceolatus var. *lanceolatus*	38.82	-	-	-	-	-	-	-	-	-	-
Leucopogon microphyllus var. *pilibundus*	0.41	-	-	-	-	-	-	-	-	-	-
Leucopogon parviflorus	1.10	-	-	-	-	-	-	-	-	-	-
Leucopogon pilifer	0	-	-	-	-	+	-	-	-	-	-
Leucopogon setiger	0.31	-	-	-	-	+	-	-	S	+	-
Leucopogon virgatus	0.45	-	-	-	-	-	-	-	-	-	-
Lissanthe strigosa subsp. *subulata*	1.31	-	-	-	-	-	-	-	-	-	-
Melichrus urceolatus	0.28	-	-	-	-	-	-	-	-	-	-
Monotoca albens	0.24	-	-	-	-	+	-	-	-	-	-
Monotoca elliptica	1.55	-	-	-	-	-	-	-	-	-	-
Monotoca rotundifolia	0	-	+	-	-	-	-	-	-	-	-
Monotoca scoparia	11.01	-	-	-	-	-	-	-	-	-	-
Sprengelia incarnata	0.58	-	-	-	-	-	-	-	-	-	-
Styphelia adscendens	0.03	-	-	-	-	+	-	-	-	-	-
Styphelia psiloclada	0.28	-	-	+	-	-	-	-	-	-	-
Trochocarpa laurina	0	-	-	-	-	+	+	-	S	+	-
Ericaceae											
Gaultheria appressa	0.34	-	-	-	-	+	-	-	-	-	-
Eucryphiaceae											
Eucryphia moorei	0.41	-	-	+	-	-	-	-	-	-	-
Euphorbiaceae											
Adriana glabrata var. *subglabra*	0	-	-	-	-	+	-	-	-	-	-
Amperea xiphoclada var. *xiphoclada*	5.92	-	-	-	-	-	-	-	-	-	-
Bertya rosmarinifolia	0.03	-	-	-	-	+	-	-	-	-	-
Beyeria lasiocarpa	4.40	-	-	-	-	-	-	-	-	-	-
Beyeria viscosa	0	-	-	-	-	+	-	-	-	-	-
Breynia oblongifolia	3.99	-	-	-	-	-	-	-	S	-	-
Claoxylon australe	0.69	-	-	-	-	-	-	-	S	-	-
Micranthium hexandrum	0	-	-	-	-	+	-	-	-	-	-
Omalanthus populifolius	0.24	-	-	-	-	-	-	-	S	-	-
Omalanthus stillingifolius	0	-	-	-	-	+	-	-	S	-	-
Phyllanthus gasstroemii	0.79	-	-	-	-	-	-	-	-	-	-
Phyllanthus gunnii	1.03	-	-	-	-	-	-	-	-	-	-
Phyllanthus hirtellus	1.89	-	-	-	-	-	-	-	-	-	-
Phyllanthus similis	0.24	-	-	-	-	-	-	-	-	-	-
Poranthera corymbosa	0.41	-	-	-	-	-	-	-	-	-	-
Poranthera ericifolia	0.07	-	-	-	-	+	-	-	S	-	-
Poranthera microphylla	16.55	-	-	-	-	-	-	-	-	-	-
Pseudanthus divaricatissimus	0.21	-	-	+	-	-	-	-	-	-	-
Pseudanthus ovalifolius	0	-	+	-	-	+	-	-	N	+	-
Ricinocarpos pinifolius	0.62	-	-	-	-	-	-	-	-	-	-
Eupomatiaceae											
Eupomatia laurina	1.55	-	-	-	-	-	-	-	-	-	-
Fabaceae (Caesalpinioideae)											
Senna aciphylla	0	-	-	-	-	+	-	-	-	-	-
Senna odorata	0.03	-	-	-	-	+	-	-	S	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Fabaceae (Faboideae)											
Almaleea paludosa	0.03	-	-	-	-	+	-	-	-	-	-
Almaleea subumbellata	0.03	-	-	-	-	+	-	-	-	-	-
Aotus ericoides	2.72	-	-	-	-	-	-	-	-	-	-
Bossiaea bracteosa	0.03	-	-	-	-	+	-	-	-	-	-
Bossiaea buxifolia	2.10	-	-	-	-	-	-	-	-	-	-
Bossiaea cinerea	0.03	-	-	-	-	-	-	-	N	-	-
Bossiaea ensata	0.76	-	-	-	-	-	-	-	-	-	-
Bossiaea foliosa	1.58	-	-	-	-	-	-	-	-	-	-
Bossiaea heterophylla	0.69	-	-	-	-	-	-	-	-	-	-
Bossiaea obcordata	4.44	-	-	-	-	-	-	-	-	-	-
Bossiaea prostrata	2.82	-	-	-	-	-	-	-	-	-	-
Chorizema parvifolium	0	-	-	-	-	+	-	+	S	+	-
Cullen microcephalum	0.52	-	-	-	-	+	-	-	-	-	-
Cullen tenax	0.07	-	-	-	-	+	-	-	-	-	-
Daviesia acicularis	0	-	-	-	-	+	-	-	S	-	-
Daviesia alata	0	-	-	-	-	+	-	-	S	-	-
Daviesia buxifolia	1.65	-	-	-	-	-	-	-	-	-	-
Daviesia corymbosa	0.52	-	-	-	-	-	-	-	S	-	-
Daviesia latifolia	1.34	-	-	-	-	-	-	-	-	-	-
Daviesia leptophylla	0	-	-	-	-	+	-	-	-	-	-
Daviesia mimosoides var. *mimosoides*	4.13	-	-	-	-	-	-	-	-	-	-
Daviesia suaveolens	0.93	-	-	+	-	-	-	-	S	-	-
Daviesia ulicifolia subsp. *ulicifolia*	5.68	-	-	-	-	-	-	-	-	-	-
Daviesia ulicifolia subsp. *ruscifolia*	0	-	-	-	-	-	-	-	-	-	-
Daviesia wyattiana	0.31	-	-	-	-	+	-	-	-	-	-
Desmodium brachypodum	1.17	-	-	-	-	-	-	-	-	-	-
Desmodium gunnii	20.41	-	-	-	-	-	-	-	-	-	-
Desmodium rhytidophyllum	0	-	-	-	-	+	-	-	-	-	-
Desmodium varians	0.38	-	-	-	-	-	-	-	-	-	-
Dillwynia glaberrima	1.55	-	-	-	-	-	-	-	-	-	-
Dillwynia juniperina	0.41	-	-	-	-	+	-	-	-	-	-
Dillwynia phylicoides species complex	0.10	-	-	-	-	-	-	-	-	-	-
Dillwynia prostrata	0.03	-	-	-	-	+	-	-	-	-	-
Dillwynia ramosissima	0.03	-	-	-	-	+	-	-	-	-	-
Dillwynia sericea	1.17	-	-	-	-	-	-	-	-	-	-
Glycine clandestina species complex	29.56	-	-	-	-	-	-	-	-	-	-
Glycine tabacina species complex	1.82	-	-	-	-	-	-	-	-	-	-
Glycine sp. aff. *tomentella*	0.03	-	-	-	-	+	-	-	-	-	-
Gompholobium glabratum	0.14	-	-	-	-	-	-	-	-	-	-
Gompholobium huegelii	1.75	-	-	-	-	-	-	-	-	-	-
Gompholobium latifolium	0.41	-	-	-	-	-	-	-	-	-	-
Gompholobium minus	0.10	-	-	-	-	+	-	-	-	-	-
Gompholobium sp. B	0.07	-	-	-	-	+	-	-	-	-	-
Goodia lotifolia var. *lotifolia*	7.60	-	-	-	-	-	-	-	-	-	-
Hardenbergia violacea	14.01	-	-	-	-	-	-	-	-	-	-
Hovea linearis	2.99	-	-	-	-	-	-	-	-	-	-
Hovea longifolia	0.03	-	-	-	-	+	-	-	S	+	-
Hovea purpurea	0.65	-	-	-	-	-	-	-	-	-	-
Indigofera australis subsp. *australis*	11.70	-	-	-	-	-	-	-	-	-	-
Jacksonia scoparia	0.28	-	-	-	-	+	-	-	S	+	-
Kennedia prostrata	0.28	-	-	-	-	-	-	-	-	-	-
Kennedia rubicunda	8.95	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Fabaceae (Faboideae) cont.											
Lespedeza juncea	0	-	-	-	-	+	-	-	-	-	-
Lotus australis	0	-	-	-	-	+	-	-	-	-	-
Mirbelia oxylobioides	0.24	-	-	-	-	-	-	-	-	-	-
Mirbelia platylobioides	0.14	-	-	-	-	-	-	-	-	-	-
Mirbelia pungens	0.03	-	-	-	-	+	-	-	-	-	-
Mirbelia rubiifolia	0.14	-	-	-	-	-	-	-	-	-	-
Oxylobium arborescens	0.96	-	-	-	-	-	-	-	-	-	-
Oxylobium ellipticum	1.17	-	-	-	-	-	-	-	-	-	-
Platylobium formosum	2.68	-	-	-	-	-	-	-	-	-	-
Podolobium alpestre	0.07	-	-	-	-	+	-	-	-	-	-
Podolobium ilicifolium	9.43	-	-	-	-	-	-	-	-	-	-
Podolobium procumbens	0.89	-	-	-	-	-	-	-	-	-	-
Podolobium scandens var. *scandens*	0	-	-	+	-	+	-	-	S	-	-
Pultenaea altissima	0.07	-	-	-	-	+	-	-	-	-	+
Pultenaea benthamii	0.76	-	-	-	-	-	-	-	N	-	-
Pultenaea blakelyi	0.03	-	-	-	-	+	-	-	S	-	-
Pultenaea capitellata	0	-	-	-	-	+	-	-	-	-	-
Pultenaea daphnoides	6.99	-	-	-	-	-	-	-	-	-	-
Pultenaea dentata	0.21	-	-	-	-	-	-	-	-	-	-
Pultenaea elliptica	0	-	-	-	-	+	-	-	S	-	-
Pultenaea hispidula	0	-	-	-	-	+	-	-	-	-	-
Pultenaea linophylla	1.10	-	-	-	-	-	-	-	-	-	-
Pultenaea paleacea var. *sericea*	0.03	-	-	-	-	+	-	-	N	-	-
Pultenaea parrisiae subsp. *parrisiae*	0	-	+	-	+	-	-	-	-	-	-
Pultenaea pedunculata	0	-	-	-	-	+	-	-	LN	-	-
Pultenaea polifolia	0.03	-	-	-	-	+	-	-	-	-	-
Pultenaea retusa	1.58	-	-	-	-	-	-	-	-	-	-
Pultenaea scabra var. *biloba*	0.65	-	-	-	-	-	-	-	-	-	-
Pultenaea scabra var. *scabra*	1.27	-	-	-	-	-	-	-	-	-	-
Pultenaea subspicata	0	-	-	-	-	+	-	-	-	-	-
Pultenaea villifera	0.31	-	-	+	-	-	-	-	S	+	-
Pultenaea villosa	0	-	-	-	-	-	-	-	-	-	-
Pultenaea viscosa	0.14	-	-	-	-	-	-	-	-	-	-
Swainsona behriana	0.03	-	-	-	-	+	-	-	-	-	-
Swainsona lessertiifolia	0	-	-	-	-	+	-	-	-	-	-
Sphaerolobium minus	0.24	-	-	-	-	-	-	-	-	-	-
Sphaerolobium vimineum	0.24	-	-	-	-	-	-	-	-	-	-
Viminaria juncea	0.10	-	-	-	-	-	-	-	-	-	-
Zornia dyctiocarpa var. *dyctiocarpa*	0.03	-	-	-	-	+	-	+	S	-	-
Fabaceae (Mimosoideae)	0										
Acacia aculeatissima	0.21	-	-	-	-	-	-	-	N	-	-
Acacia binervia	0.21	-	-	-	-	-	-	-	-	-	-
Acacia blayana	0.14	+	-	+	-	-	-	-	-	-	-
Acacia brownii	0.14	-	-	-	-	-	-	-	-	-	-
Acacia cognata	2.89	-	-	-	-	-	-	-	-	-	-
Acacia constablei	0	+	+	-	-	-	-	-	-	-	-
Acacia costiniana	0.10	-	-	+	+	-	-	-	S	+	-
Acacia covenyi	0	-	-	+	-	-	-	-	S	+	-
Acacia dawsonii	0.03	-	-	-	-	-	-	+	-	-	-
Acacia dealbata subsp. *dealbata*	10.08	-	-	-	-	-	-	-	-	-	-
Acacia dealbata subsp. *subalpina*	0	-	-	-	-	-	-	-	-	-	-
Acacia deanei subsp. *paucijuga*	0.07	-	-	-	-	+	-	-	-	-	-

Appendix 1 cont.	Freq. (%)	1	2	3	4	5	5X	6	7	8	9
Fabaceae (Mimosoideae) cont.											
Acacia elongata	0.07	-	-	-	-	+	-	-	S	-	-
Acacia falciformis	20.20	-	-	-	-	-	-	-	-	-	-
Acacia floribunda	1.62	-	-	-	-	-	-	-	-	-	-
Acacia genistifolia	0.17	-	-	-	-	-	-	-	-	-	-
Acacia georgensis	0	+	+	-	-	-	-	-	-	-	-
Acacia gunnii	0.41	-	-	-	-	+	-	-	-	-	-
Acacia implexa	3.68	-	-	-	-	-	-	-	-	-	-
Acacia irrorata subsp. *irrorata*	3.20	-	-	-	-	-	-	-	LS	-	-
Acacia kybeanensis	0.10	-	-	-	-	-	-	-	-	-	-
Acacia kydrensis	0.17	-	-	+	+	-	-	-	S	-	-
Acacia lanigera var. *gracilipes*	0.07	-	-	-	-	+	-	-	N	-	-
Acacia leprosa	0	-	-	-	-	+	-	-	-	-	-
Acacia longifolia	11.46	-	-	-	-	-	-	-	-	-	-
Acacia lucasii	0.24	-	-	+	-	-	-	-	LS	-	-
Acacia mabellae	0.03	-	-	-	-	+	-	-	S	-	-
Acacia maidenii	0.69	-	-	-	-	-	-	-	-	-	-
Acacia mearnsii	15.07	-	-	-	-	-	-	-	-	-	-
Acacia melanoxylon	8.16	-	-	-	-	-	-	-	-	-	-
Acacia mucronata var. *longifolia*	5.02	-	-	-	-	-	-	-	N	-	-
Acacia myrtifolia	3.85	-	-	-	-	-	-	-	-	-	-
Acacia obliquinervia	2.51	-	-	-	-	-	-	-	-	-	-
Acacia obtusifolia	10.98	-	-	-	-	-	-	-	-	-	-
Acacia oxycedrus	0.03	-	-	-	-	+	-	-	LN	-	-
Acacia paradoxa	0	-	-	-	-	-	+	-	-	-	-
Acacia penninervis	0.89	-	-	-	-	-	-	-	-	-	-
Acacia pycnantha	0.03	-	-	-	-	+	-	-	-	-	+
Acacia rubida	1.03	-	-	-	-	-	-	-	-	-	-
Acacia siculiformis	0.10	-	-	-	-	-	-	-	-	-	-
Acacia silvestris	0.86	-	-	-	-	-	-	-	LS	-	-
Acacia sophorae	1.93	-	-	-	-	-	-	-	-	-	-
Acacia stricta	0.69	-	-	-	-	-	-	-	-	-	-
Acacia suaveolens	1.51	-	-	-	-	-	-	-	-	-	-
Acacia subporosa	2.31	-	-	-	+	-	-	-	N	-	-
Acacia subtilinervis	0.07	-	-	+	-	-	-	-	-	+	-
Acacia terminalis subsp. *angustifolia*	11.63	-	-	-	-	-	-	-	-	-	-
Acacia ulicifolia	1.82	-	-	-	-	-	-	-	-	-	-
Acacia verniciflua	0.41	-	-	-	-	-	-	-	-	-	-
Acacia verticillata var. *verticillata*	0.45	-	-	-	-	-	-	-	N	-	-
Gentianaceae											
Chionogentias cunninghamii subsp. *cunninghamii*	0.21	-	-	-	-	-	-	-	-	-	-
Sebaea ovata	0	-	-	-	-	-	+	-	-	-	-
Geraniaceae											
Geranium antrorsum	0.17	-	-	-	-	-	-	-	-	-	-
Geranium homeanum	2.13	-	-	-	-	-	-	-	-	-	-
Geranium neglectum	0.55	-	-	-	-	-	-	-	-	-	-
Geranium potentilloides var. *potentilloides*	12.80	-	-	-	-	-	-	-	-	-	-
Geranium retrorsum	0.10	-	-	-	-	+	-	-	-	-	-
Geranium solanderi var. *solanderi*	7.40	-	-	-	-	-	-	-	-	-	-
Pelargonium australe subsp. *australe*	0.65	-	-	-	-	-	-	-	-	-	-
Pelargonium inodorum	0.69	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Gesneriaceae											
Fieldia australis	1.48	-	-	-	-	-	-	-	-	-	-
Goodeniaceae											
Coopernookia barbata	1.75	-	-	-	-	-	-	-	-	-	-
Dampiera fusca	0.14	-	-	+	-	-	-	-	LN	+	-
Dampiera stricta	3.06	-	-	-	-	-	-	-	-	-	-
Goodenia bellidifolia subsp. *bellidifolia*	0.14	-	-	-	-	-	-	-	-	-	-
Goodenia elongata	0.17	-	-	-	-	-	-	-	N	-	-
Goodenia hederacea var. *alpestris*	0.45	-	-	-	-	+	-	-	-	-	-
Goodenia hederacea var. *hederacea*	0.10	-	-	-	-	+	-	-	S	-	-
Goodenia heterophylla subsp. *eglandulosa*	0.03	-	-	-	-	+	-	-	S	-	-
Goodenia humilis	0.03	-	-	-	-	+	-	-	N	-	-
Goodenia ovata	17.86	-	-	-	-	-	-	-	-	-	-
Goodenia paniculata	0.14	-	-	-	-	+	-	-	-	-	-
Goodenia stelligera	0.10	-	-	-	-	+	-	-	-	-	-
Scaevola aemula	0.28	-	-	-	-	-	-	-	-	-	-
Scaevola albida	0.07	-	-	-	-	+	-	-	-	-	-
Scaevola calendulacea	0.07	-	-	-	-	+	-	-	-	-	-
Scaevola hookeri	0	-	-	-	-	-	-	-	-	-	-
Scaevola ramosissima	2.00	-	-	-	-	-	-	-	-	-	-
Selliera radicans	1.07	-	-	-	-	-	-	-	-	-	-
Velleia montana	0.03	-	-	-	-	+	-	-	-	-	-
Velleia paradoxa	0	-	-	-	-	+	-	-	-	-	-
Haloragaceae											
Gonocarpus humilis	0.03	-	-	-	-	+	-	-	-	-	-
Gonocarpus micranthus	1.03	-	-	-	-	-	-	-	-	-	-
Gonocarpus tetragynus	11.67	-	-	-	-	-	-	-	-	-	-
Gonocarpus teucrioides	28.53	-	-	-	-	-	-	-	-	-	-
Haloragis heterophylla	0.17	-	-	-	-	+	-	-	-	-	-
Haloragodendron baeuerlenii	0.03	-	-	+	-	-	-	-	-	-	-
Haloragodendron monospermum	0.28	-	-	+	-	-	-	-	S	-	-
Myriophyllum caput-medusae	0	-	-	-	-	+	-	-	-	-	-
Myriophyllum pedunculatum subsp. *pedunculatum*	0.07	-	-	-	-	+	-	-	-	-	-
Myriophyllum propinquum	0.03	-	-	-	-	+	-	-	-	-	-
Myriophyllum simulans	0	-	-	-	-	+	-	-	-	-	-
Myriophyllum variifolium	0.07	-	-	-	-	-	-	-	-	-	-
Myriophyllum verrucosum	0	-	-	-	-	+	-	-	-	-	-
Lamiaceae											
Ajuga australis	3.13	-	-	-	-	-	-	-	-	-	-
Lycopus australis	0.21	-	-	-	-	-	-	-	-	-	-
Mentha diemenica	0.58	-	-	-	-	-	-	-	-	-	-
Mentha laxiflora	0	-	-	-	-	+	-	-	-	-	-
Mentha satureioides	0.28	-	-	-	-	-	-	-	-	-	-
Plectranthus graveolens	0.55	-	-	-	-	-	-	-	S	+	-
Plectranthus parviflorus	6.06	-	-	-	-	-	-	-	-	-	-
Prostanthera decussata	0	-	-	-	-	+	-	-	N	-	-
Prostanthera denticulata s.lat.	0	-	-	-	-	+	-	-	-	-	-
Prostanthera hirtula	0	-	-	-	-	-	-	-	S	-	-
Prostanthera incana	0.34	-	-	-	-	-	-	-	-	-	-
Prostanthera incisa	1.89	-	-	-	-	-	-	-	S	-	-
Prostanthera lasianthos	4.85	-	-	-	-	-	-	-	-	-	-
Prostanthera linearis	0	-	-	-	-	+	-	-	S	-	-

Appendix 1 cont.	Freq. (%)	1	2	3	4	5	5X	6	7	8	9
Lamiaceae cont.											
Prostanthera melissifolia	0.10	-	-	-	-	-	-	-	-	-	-
Prostanthera nivea var. *nivea*	0	-	-	-	-	+	-	-	-	-	-
Prostanthera ovalifolia	0.10	-	-	-	-	-	-	-	-	-	-
Prostanthera phylicifolia	0.03	-	-	-	-	+	-	-	-	-	-
Prostanthera rotundifolia	0.14	-	-	-	-	-	-	-	-	-	-
Prostanthera saxicola var. *montana*	0	-	-	-	-	+	-	-	S	-	-
Prostanthera scutellarioides	0	-	-	-	-	+	-	-	S	-	-
Prostanthera violacea	0.07	-	-	-	-	+	-	-	-	-	-
Prostanthera walteri	0	-	-	+	-	-	-	-	N	-	-
Scutellaria humilis	0.24	-	-	-	-	-	-	-	-	-	-
Scutellaria mollis	0.45	-	-	-	-	-	-	-	-	-	-
Teucrium corymbosum	0.10	-	-	-	-	-	-	-	-	-	-
Westringia davidii	0.14	+	+	-	-	-	-	-	-	-	-
Westringia eremicola	0.31	-	-	-	-	-	-	-	-	-	-
Westringia fruticosa	0.45	-	-	-	-	-	-	-	S	-	-
Westringia kydrensis	0	+	+	-	-	-	-	-	-	-	-
Lauraceae											
Cassytha glabella	2.27	-	-	-	-	-	-	-	-	-	-
Cassytha melantha	0.21	-	-	-	-	-	-	-	-	-	-
Cassytha pubescens	4.78	-	-	-	-	-	-	-	-	-	-
Cryptocarya glaucescens	0	-	-	-	-	+	-	-	S	-	-
Cryptocarya microneura	0	-	-	-	-	+	-	-	S	+	-
Lentibulariaceae											
Utricularia dichotoma	0.31	-	-	-	-	-	-	-	-	-	-
Utricularia lateriflora	0.03	-	-	-	-	+	-	-	-	-	-
Utricularia monanthos	0	-	-	-	-	+	-	-	-	-	-
Linaceae											
Linum marginale	0.07	-	-	-	-	+	-	-	-	-	-
Lobeliaceae											
Isotoma axillaris	0.34	-	-	-	-	-	-	-	-	-	-
Lobelia alata	0.93	-	-	-	-	-	-	-	-	-	-
Lobelia dentata	0.21	-	-	-	-	-	-	-	S	-	-
Lobelia gibbosa	0.07	-	-	-	-	+	-	-	-	-	-
Pratia pedunculata	0.34	-	-	-	-	-	-	-	-	-	-
Pratia puberula	0	-	-	-	-	+	-	-	-	-	-
Pratia purpurascens	10.43	-	-	-	-	-	-	-	-	-	-
Pratia surrepens	0.10	-	-	-	-	-	-	-	-	-	-
Loganiaceae											
Logania albiflora	1.14	-	-	-	-	-	-	-	-	-	-
Logania pusilla	0.34	-	-	-	-	-	-	-	-	-	-
Mitrasacme pilosa	0.07	-	-	-	-	+	-	-	-	-	-
Mitrasacme polymorpha	0.55	-	-	-	-	-	-	-	-	-	-
Mitrasacme serpyllifolia	0.21	-	-	+	-	-	-	-	-	-	-
Loranthaceae											
Amyema cambagei	0	-	-	-	-	+	-	-	S	-	-
Amyema congener subsp. *congener*	0.24	-	-	-	-	-	-	-	S	-	-
Amyema miquelii	0.03	-	-	-	-	+	-	-	-	-	-
Amyema pendulum subsp. *pendulum*	1.62	-	-	-	-	-	-	-	-	-	-
Muellerina eucalyptoides	0.76	-	-	-	-	-	-	-	-	-	-
Lythraceae											
Lythrum hyssopifolia	0.10	-	-	-	-	-	-	-	-	-	-
Lythrum salicaria	0.24	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.

	Freq. (%)	1	2	3	4	5	5X	6	7	8	9
Malvaceae											
Abutilon oxycarpum	0.14	-	-	-	-	-	-	-	-	-	-
Gynatrix pulchella	0.10	-	-	-	-	-	-	-	-	-	-
Howittia trilocularis	0.48	-	-	-	-	-	-	-	-	-	-
Meliaceae											
Synoum glandulosum	2.37	-	-	-	-	-	-	-	S	-	-
Menispermaceae											
Sarcopetalum harveyanum	3.30	-	-	-	-	-	-	-	-	-	-
Stephania japonica var. *discolor*	2.55	-	-	-	-	-	-	-	S	-	-
Menyanthaceae											
Nymphoides montana	0	-	-	-	-	+	-	-	-	-	-
Villarsia exaltata	0.10	-	-	-	-	+	-	-	-	-	-
Villarsia reniformis	0.17	-	-	-	-	+	-	-	-	-	-
Monimiaceae											
Atherosperma moschatum	0.10	-	-	-	-	+	-	-	-	-	-
Doryphora sassafras	0.69	-	-	-	-	-	-	-	S	-	-
Hedycarya angustifolia	3.06	-	-	-	-	-	-	-	-	-	-
Moraceae											
Ficus coronata	0.52	-	-	-	-	-	-	-	-	-	-
Ficus obliqua	0	-	-	-	-	+	-	-	S	-	-
Ficus rubiginosa	0.89	-	-	-	-	-	-	-	S	-	-
Myoporaceae											
Myoporum acuminatum	0.48	-	-	-	-	-	-	-	S	-	-
Myoporum boninense subsp. *australe*	0	-	-	-	-	+	-	-	S	-	-
Myoporum bateae	0.03	-	-	+	-	-	-	-	S	-	-
Myoporum montanum	0	-	-	-	-	+	-	-	-	-	-
Myoporum insulare	0.21	-	-	-	-	-	-	-	-	-	-
Myrsinaceae											
Aegiceras corniculatum	0.31	-	-	-	-	+	-	-	S	-	-
Rapanea howittiana	3.03	-	-	-	-	-	-	-	-	-	-
Myrtaceae											
Acmena smithii	3.75	-	-	-	-	-	-	-	-	-	-
Angophora floribunda	11.80	-	-	-	-	-	-	-	-	-	-
Backhousia myrtifolia	0.76	-	-	-	-	-	-	-	S	-	-
Baeckea denticulata	0.28	-	-	+	-	-	-	-	S	-	-
Baeckea linifolia	0.31	-	-	-	-	-	-	-	-	-	-
Baeckea ramosissima subsp. *prostrata*	0	-	-	-	-	+	-	-	-	-	-
Baeckea utilis	0.79	-	-	-	-	-	-	-	-	-	-
Babingtonia virgata	2.82	-	-	-	-	-	-	-	-	-	-
Callistemon citrinus	0.69	-	-	-	-	-	-	-	-	-	-
Callistemon pallidus	0.55	-	-	-	-	-	-	-	S	-	-
Callistemon pityoides	0.07	-	-	-	-	+	-	-	-	-	-
Callistemon sieberi	0	-	-	-	-	+	-	-	-	-	-
Callistemon subulatus	0.45	-	-	-	-	-	-	-	-	-	-
Calytrix tetragona	0.41	-	-	-	-	-	-	-	-	-	-
Corymbia gummifera	6.30	-	-	-	-	-	-	-	-	-	-
Corymbia maculata	0.41	-	-	-	-	-	-	-	LS	-	-
Darwinia camptostylis	0.28	-	-	-	-	-	-	-	-	-	-
Eucalyptus agglomerata	12.80	-	-	-	-	-	-	-	-	-	-
Eucalyptus amplifolia subsp. *amplifolia*	0	-	-	-	-	+	-	-	S	+	-
Eucalyptus angophoroides	5.92	-	-	-	-	-	-	-	-	-	-
Eucalyptus badjensis	0.58	-	-	+	+	-	-	-	S	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Myrtaceae cont.											
Eucalyptus baueriana	2.82	-	-	-	-	-	-	+	-	-	-
Eucalyptus baeuerlenii	0	-	-	+	-	-	-	-	S	+	-
Eucalyptus baxteri	0.86	-	-	-	-	-	-	-	N	-	-
Eucalyptus blaxlandii	0.03	-	-	-	-	+	-	-	S	-	-
Eucalyptus bosistoana	6.61	-	-	-	-	-	-	-	-	-	-
Eucalyptus botryoides	1.31	-	-	-	-	-	-	-	-	-	-
Eucalyptus bridgesiana	0.03	-	-	-	-	-	-	-	-	-	-
Eucalyptus camphora subsp. *humeana*	0	-	-	-	-	-	-	-	-	-	-
Eucalyptus cephalocarpa	0.03	-	-	+	-	-	-	-	N	-	-
Eucalyptus consideniana	2.89	-	-	-	-	-	-	-	-	-	-
Eucalyptus conspicua	0.07	-	-	+	-	-	-	-	N	-	-
Eucalyptus croajingolensis	0.14	-	-	-	-	-	-	-	N	-	-
Eucalyptus cypellocarpa	26.98	-	-	-	-	-	-	-	-	-	-
Eucalyptus dalrympleana subsp. *dalrympleana*	2.48	-	-	-	-	-	-	-	-	-	-
Eucalyptus denticulata	0.03	-	-	-	-	+	-	-	-	-	-
Eucalyptus dives	1.45	-	-	-	-	-	-	-	-	-	-
Eucalyptus elata	10.32	-	-	-	-	-	-	-	-	-	-
Eucalyptus eugenioides	0.07	-	-	-	-	-	-	-	S	-	-
Eucalyptus fastigata	11.11	-	-	-	-	-	-	-	-	-	-
Eucalyptus fraxinoides	2.96	-	-	-	-	-	-	-	-	-	-
Eucalyptus globoidea	24.74	-	-	-	-	-	-	-	-	-	-
Eucalyptus gregsoniana	0	-	-	+	-	-	-	-	S	-	-
Eucalyptus ignorabilis	0.03	-	-	+	-	-	-	-	N	-	-
Eucalyptus imlayensis	0	+	+	-	-	-	-	-	-	-	-
Eucalyptus kybeanensis	0.31	-	-	-	-	-	-	-	-	-	-
Eucalyptus latiuscula	0.14	-	-	+	-	-	-	-	S	-	-
Eucalyptus longifolia	7.43	-	-	-	-	-	-	-	S	-	-
Eucalyptus mackintii	0.24	-	-	-	-	+	-	-	N	-	-
Eucalyptus macrorhyncha	0.03	-	-	-	-	-	-	-	-	-	-
Eucalyptus maidenii	5.30	-	-	-	-	-	-	-	-	-	+
Eucalyptus mannifera	0.31	-	-	-	-	-	-	-	-	-	-
Eucalyptus melliodora	0.58	-	-	-	-	-	-	+	-	-	+
Eucalyptus muelleriana	17.14	-	-	-	-	-	-	-	-	-	-
Eucalyptus nitens	1.27	-	-	-	-	-	-	-	-	-	-
Eucalyptus obliqua	13.80	-	-	-	-	-	-	-	-	-	-
Eucalyptus olsenii	0	-	-	+	-	-	-	-	-	-	-
Eucalyptus ovata	2.24	-	-	-	-	-	-	-	-	-	-
Eucalyptus paliformis	0.03	+	-	+	-	-	-	-	-	-	-
Eucalyptus paniculata subsp. *paniculata*	0.10	-	-	-	-	-	-	-	S	-	-
Eucalyptus parvula	0.07	-	+	-	+	-	-	-	S	-	-
Eucalyptus pauciflora	2.44	-	-	-	-	-	-	-	-	-	-
Eucalyptus perriniana	0	-	-	-	-	+	-	-	-	-	-
Eucalyptus pilularis	0.24	-	-	-	-	-	-	-	S	-	-
Eucalyptus polyanthemos subsp. *vestita*	1.93	-	-	-	-	-	-	-	LN	-	-
Eucalyptus pseudoglobulus	0.07	-	-	-	-	+	-	-	N	-	-
Eucalyptus radiata subsp. *radiata*	8.47	-	-	-	-	-	-	-	-	-	-
Eucalyptus rubida subsp. *rubida*	0.65	-	-	-	-	-	-	-	-	-	-
Eucalyptus sieberi	28.66	-	-	-	-	-	-	-	-	-	-
Eucalyptus smithii	4.71	-	-	-	-	-	-	-	-	-	-
Eucalyptus sp. aff. *globoidea*	0	-	-	+	+	-	-	-	N	-	-
Eucalyptus sp. aff. *radiata*	1.79	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Myrtaceae cont.											
Eucalyptus spectatrix	0	+	-	+	-	-	-	-	-	-	-
Eucalyptus stellulata	0.38	-	-	-	-	-	-	-	-	-	-
Eucalyptus stenostoma	0.45	-	-	-	-	-	-	-	S	-	-
Eucalyptus tereticornis	2.41	-	-	-	-	-	-	+	-	-	-
Eucalyptus tricarpa	4.20	-	-	-	-	-	-	-	-	-	-
Eucalyptus viminalis	5.78	-	-	-	-	-	-	-	-	-	-
Eucalyptus wilcoxii	0	-	-	+	-	-	-	-	S	-	-
Eucalyptus yangoura	0	-	-	-	-	-	-	-	N	-	-
Kunzea ambigua	2.51	-	-	-	-	-	-	-	-	-	-
Kunzea ericoides	3.27	-	-	-	-	-	-	-	-	-	-
Kunzea parvifolia	0.14	-	-	-	-	+	-	-	-	-	-
Kunzea sp. C	0.62	-	-	-	-	-	-	-	S	-	-
Leptospermum brevipes	0.28	-	-	-	-	-	-	-	-	-	-
Leptospermum continentale	5.51	-	-	-	-	-	-	-	-	-	-
Leptospermum emarginatum	0.62	-	-	-	-	-	-	-	-	-	-
Leptospermum grandifolium	0.14	-	-	-	-	-	-	-	-	-	-
Leptospermum laevigatum	0.72	-	-	-	-	-	-	-	LN	-	-
Leptospermum lanigerum	1.17	-	-	-	-	-	-	-	-	-	-
Leptospermum morrisonii	0.10	-	-	-	-	-	-	-	S	-	-
Leptospermum myrsinoides	0.24	-	-	-	-	-	-	-	N	-	-
Leptospermum myrtifolium	0.65	-	-	-	-	-	-	-	-	-	-
Leptospermum obovatum	0.10	-	-	-	-	-	-	-	-	-	-
Leptospermum polygalifolium subsp. *polygalifolium*	0.24	-	-	-	-	-	-	-	S	-	-
Leptospermum rotundifolium	0	-	-	-	-	+	-	-	S	+	-
Leptospermum scoparium	1.34	-	-	-	-	-	-	-	N	-	-
Leptospermum trinervium	2.96	-	-	-	-	-	-	-	-	-	-
Melaleuca armillaris	2.82	-	-	-	-	-	-	-	-	-	-
Melaleuca ericifolia	0.72	-	-	-	-	-	-	-	-	-	-
Melaleuca hypericifolia	0.24	-	-	-	-	-	-	-	S	-	-
Melaleuca parvistaminea	0	-	-	-	-	-	-	-	-	-	-
Melaleuca squarrosa	1.17	-	-	-	-	-	-	-	-	-	-
Micromyrtus ciliata	0	-	-	-	-	+	-	-	-	-	-
Syzygium australe	0	-	-	-	-	+	-	-	S	+	-
Tristaniopsis collina	0.10	-	-	-	-	+	-	-	S	-	-
Tristaniopsis laurina	0.38	-	-	-	-	-	-	-	-	-	-
Olacaceae											
Olax stricta	0	-	-	-	-	+	-	-	-	-	-
Oleaceae											
Nestegis ligustrina	0.34	-	-	-	-	-	-	-	-	-	-
Notelaea longifolia forma *longifolia*	0.10	-	-	-	-	+	-	-	S	-	-
Notelaea venosa	13.76	-	-	-	-	-	-	-	-	-	-
Onagraceae											
Epilobium billardierianum subsp. *billardierianum*	0.28	-	-	-	-	-	-	-	-	-	-
Epilobium billardierianum subsp. *cinereum*	1.31	-	-	-	-	-	-	-	-	-	-
Epilobium billardierianum subsp. *hydrophilum*	0.45	-	-	-	-	-	-	-	-	-	-
Epilobium gunnianum	0.28	-	-	-	-	-	-	-	-	-	-
Epilobium pallidiflorum	0	-	-	+	-	-	-	+	-	-	-
Ludwigia peploides subsp. *montevidensis*	0	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	Freq. (%)	1	2	3	4	5	5X	6	7	8	9
Oxalidaceae											
Oxalis chnoodes	2.20	-	-	-	-	-	-	-	-	-	-
Oxalis exilis	0.65	-	-	-	-	-	-	-	-	-	-
Oxalis perennans	14.66	-	-	-	-	-	-	-	-	-	-
Oxalis rubens	0.03	-	-	-	-	+	-	-	-	-	-
Oxalis thompsoniae	0	-	-	-	-	-	-	-	-	-	-
Passifloraceae											
Passiflora cinnabarina	1.00	-	-	-	-	-	-	-	-	-	-
Pittosporaceae											
Billardiera longiflora	0.21	-	-	-	-	-	-	-	-	-	-
Billardiera scandens var. *scandens*	27.67	-	-	-	-	-	-	-	-	-	-
Bursaria lasiophylla	3.06	-	-	-	-	-	-	-	-	-	-
Bursaria spinosa	9.29	-	-	-	-	-	-	-	-	-	-
Citriobatus pauciflorus	0.83	-	-	-	-	-	-	-	S	-	-
Pittosporum bicolor	0.72	-	-	-	-	-	-	-	-	-	-
Pittosporum revolutum	4.75	-	-	-	-	-	-	-	-	-	-
Pittosporum undulatum	9.74	-	-	-	-	-	-	-	-	-	-
Rhytidosporum procumbens	2.10	-	-	-	-	-	-	-	-	-	-
Plantaginaceae											
Plantago debilis	8.29	-	-	-	-	-	-	-	-	-	-
Plantago hispida	0.03	-	-	-	-	+	-	-	-	-	-
Plantago varia	2.27	-	-	-	-	-	-	-	-	-	-
Plumbaginaceae											
Limonium australe	0.89	-	-	+	-	-	-	-	-	-	-
Polygalaceae											
Comesperma defoliatum	0.21	-	-	-	-	-	-	-	-	-	-
Comesperma ericinum	1.14	-	-	-	-	-	-	-	-	-	-
Comesperma retusum	0.07	-	-	-	-	+	-	-	-	-	-
Comesperma sphaerocarpa	0	-	-	-	-	+	-	-	S	-	-
Comesperma volubile	4.71	-	-	-	-	-	-	-	-	-	-
Polygala japonica	0.03	-	-	-	-	+	-	+	-	-	-
Polygonaceae											
Muehlenbeckia adpressa	0.86	-	-	-	-	-	-	-	N	-	-
Muehlenbeckia gracillima	0.07	-	-	-	-	+	-	-	S	-	-
Muehlenbeckia rhyticarya	0	-	-	-	-	+	-	-	-	-	-
Persicaria decipiens	0.31	-	-	-	-	-	-	-	-	-	-
Persicaria hydropiper	0.03	-	-	-	-	-	-	-	-	-	-
Persicaria lapathifolia	0	-	-	-	-	+	-	-	-	-	-
Persicaria praetermissa	0.10	-	-	-	-	+	-	-	-	-	-
Persicaria prostrata	0	-	-	-	-	+	-	-	-	-	-
Persicaria subsessilis	0	-	-	-	-	+	-	-	-	-	-
Rumex brownii	3.44	-	-	-	-	-	-	-	-	-	-
Rumex tenax	0	-	-	-	-	+	-	-	-	-	-
Portulacaceae											
Calandrinia calyptrata	0.07	-	-	-	-	+	-	-	-	-	-
Calandrinia pickeringii	0	-	-	-	-	+	-	-	S	-	-
Neopaxia australasica	0.07	-	-	-	-	-	-	-	-	-	+
Primulaceae											
Lysimachia japonica	0.03	-	-	-	-	+	-	-	-	-	-
Samolus repens	1.86	-	-	-	-	-	-	-	-	-	-
Samolus valerandii	0	-	-	-	-	+	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Proteaceae											
Banksia canei	1.27	-	-	-	-	-	-	-	-	-	-
Banksia cunninghamii subsp. *cunninghamii*	0.17	-	-	-	-	-	-	-	LN	-	-
Banksia integrifolia subsp. *integrifolia*	2.27	-	-	-	-	-	-	-	-	-	-
Banksia marginata	3.72	-	-	-	-	-	-	-	-	-	-
Banksia paludosa	0.79	-	-	-	-	-	-	-	S	-	-
Banksia serrata	3.58	-	-	-	-	-	-	-	-	-	-
Banksia spinulosa var. *spinulosa*	1.62	-	-	-	-	-	-	-	S	-	-
Conospermum taxifolium	0.24	-	-	-	-	-	-	-	-	-	-
Grevillea acanthifolia subsp. *paludosa*	0	+	+	-	-	-	-	-	-	-	-
Grevillea baueri	0.03	-	-	-	-	+	-	-	S	-	-
Grevillea lanigera	0.58	-	-	-	-	-	-	-	-	-	-
Grevillea linearifolia form `g' *sensu* McGillivray	0.10	-	-	-	-	-	-	-	-	-	-
Grevillea mucronulata	0	-	-	-	-	+	-	-	S	+	-
Grevillea oxyantha subsp. *oxyantha*	0.1	-	-	-	-	+	-	-	S	-	-
Grevillea victoriae var. *leptoneura*	0.62	-	-	-	-	-	-	-	N	-	-
Grevillea sp. (*irrassa* subsp. *irrassa* ms)	0.31	+	-	+	-	-	-	-	-	-	-
Grevillea sp. (*irrassa* subsp.*didymochiton* ms)	0	-	-	+	+	-	-	-	S	-	-
Hakea dactyloides	1.51	-	-	-	-	-	-	-	-	-	-
Hakea decurrens subsp. *physocarpa*	0.24	-	-	-	-	-	-	-	N	-	-
Hakea decurrens subsp. *platytaena*	0	-	-	-	-	+	-	-	N	-	-
Hakea eriantha	5.30	-	-	-	-	-	-	-	-	-	-
Hakea macraeana	3.72	-	-	-	-	-	-	-	S	-	-
Hakea microcarpa	0.58	-	-	-	-	-	-	-	-	-	-
Hakea sericea	1.72	-	-	-	-	-	-	-	S	-	-
Hakea teretifolia	0.45	-	-	-	-	-	-	-	-	-	-
Hakea ulicina	0.28	-	-	-	-	-	-	-	N	-	-
Isopogon prostratus	0.34	-	-	+	-	-	-	-	-	-	-
Lomatia fraseri	2.37	-	-	-	-	-	-	-	-	-	-
Lomatia ilicifolia	10.01	-	-	-	-	-	-	-	-	-	-
Lomatia myricoides	6.33	-	-	-	-	-	-	-	-	-	-
Persoonia asperula	0.93	-	-	-	-	+	-	-	S?	-	-
Persoonia brevifolia	0.58	-	-	+	+	-	-	-	N	-	-
Persoonia chamaepeuce	0.93	-	-	-	-	-	-	-	-	-	-
Persoonia confertiflora	0.96	-	-	-	-	-	-	-	-	-	-
Persoonia juniperina	0.28	-	-	-	-	-	-	-	N	-	-
Persoonia levis	2.03	-	-	-	-	-	-	-	-	-	-
Persoonia linearis	31.45	-	-	-	-	-	-	-	-	-	-
Persoonia rigida	0.10	-	-	-	-	-	-	-	-	-	-
Persoonia silvatica	4.20	-	-	-	-	-	-	-	-	-	-
Symphionema paludosum	0.24	-	-	-	-	-	-	-	S	+	-
Telopea oreades	0.45	-	-	-	-	-	-	-	-	-	-
Ranunculaceae											
Clematis aristata	29.63	-	-	-	-	-	-	-	-	-	-
Clematis glycinoides var. *glycinoides*	6.47	-	-	-	-	-	-	-	-	-	-
Clematis microphylla var. *leptophylla*	0.14	-	-	-	-	+	-	-	-	-	-
Ranunculus amphitrichus	0.03	-	-	-	-	-	-	-	-	-	-
Ranunculus collinus	0.03	-	-	-	-	+	-	-	-	-	-
Ranunculus diminutus	0	-	-	-	-	+	-	-	-	-	-
Ranunculus inundatus	0.28	-	-	-	-	-	-	-	-	-	-
Ranunculus lappaceus	1.24	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Ranunculaceae cont.											
Ranunculus papulentus	0	-	-	-	-	+	-	-	-	-	-
Ranunculus pimpinellifolius	0.17	-	-	-	-	+	-	-	-	-	-
Ranunculus plebeius	3.92	-	-	-	-	-	-	-	-	-	-
Ranunculus scapiger	0.17	-	-	-	-	-	-	-	-	-	-
Rhamnaceae											
Cryptandra amara var. *amara*	0.03	-	-	-	-	+	-	-	-	-	-
Cryptandra amara var. *longiflora*	0.03	-	-	-	-	+	-	-	-	-	-
Cryptandra ericoides	0.24	-	-	-	-	-	-	-	-	-	-
Cryptandra propinqua	0	-	-	-	-	+	-	-	-	-	-
Cryptandra scortechinii	0	-	-	-	-	+	-	-	S	-	-
Discaria pubescens	0.10	-	-	+	-	-	-	-	-	-	-
Pomaderris andromedifolia subsp. *andromedifolia*	0.10	-	-	-	-	-	-	-	-	-	-
Pomaderris andromedifolia subsp. *confusa*	0	-	-	+	-	-	-	-	S	-	-
Pomaderris angustifolia	0.03	-	-	-	-	+	-	-	-	-	-
Pomaderris aspera	13.66	-	-	-	-	-	-	-	-	-	-
Pomaderris betulina	0.10	-	-	-	-	+	-	-	-	-	-
Pomaderris bodalla	0	-	-	+	-	-	-	-	S	-	-
Pomaderris brogoensis	0.48	-	-	+	+	-	-	-	S	-	-
Pomaderris cinerea	1.41	-	-	-	-	-	-	-	S	-	-
Pomaderris costata	0.10	-	-	+	-	-	-	-	-	-	-
Pomaderris cotoneaster	0.03	-	+	-	-	-	-	-	-	-	-
Pomaderris discolor	0.07	-	-	-	-	+	-	-	-	-	-
Pomaderris elachophylla	0.03	-	+	-	-	+	-	-	LN	-	-
Pomaderris elliptica	0.52	-	-	-	-	-	-	-	-	-	-
Pomaderris eriocephala	0.07	-	-	-	-	+	-	-	-	-	-
Pomaderris ferruginea	0.45	-	-	-	-	-	-	-	-	-	-
Pomaderris intermedia	0.21	-	-	-	-	-	-	-	-	-	-
Pomaderris lanigera	1.72	-	-	-	-	-	-	-	-	-	-
Pomaderris ledifolia	0.10	-	-	-	-	+	-	-	-	-	-
Pomaderris ligustrina	0.24	-	-	-	-	-	-	-	-	-	-
Pomaderris pallida	0	-	+	-	-	-	-	-	-	-	-
Pomaderris parrisiae	0	-	+	-	+	-	-	-	S	-	-
Pomaderris pauciflora	0.03	-	-	+	-	-	-	-	-	-	-
Pomaderris phylicifolia var. *ericoides*	0	-	-	-	-	+	-	-	-	-	-
Pomaderris pilifera	0	-	-	-	-	+	-	-	-	-	-
Pomaderris prunifolia	0.07	-	-	-	-	+	-	-	-	-	-
Pomaderris virgata	0	-	-	+	+	-	-	-	S	-	-
Spyridium cinereum	0.03	-	-	+	-	-	-	-	-	-	-
Spyridium parvifolium	0.07	-	-	-	-	-	-	-	-	-	-
Rosaceae											
Acaena agnipila	0.14	-	-	-	-	-	-	-	-	-	-
Acaena echinata	1.07	-	-	-	-	-	-	-	-	-	-
Acaena novae-zelandiae	9.53	-	-	-	-	-	-	-	-	-	-
Acaena ovina	0.34	-	-	-	-	-	-	-	-	-	-
Rubus hillii	1.62	-	-	-	-	-	-	-	-	-	-
Rubus parvifolius	10.56	-	-	-	-	-	-	-	-	-	-
Rubus rosifolius	2.82	-	-	-	-	-	-	-	-	-	-
Rubiaceae											
Asperula conferta	1.65	-	-	-	-	-	-	-	-	-	-
Asperula gunnii	1.10	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Rubiaceae cont.											
Asperula scoparia var. *ulicina*	5.51	-	-	-	-	-	-	-	-	-	-
Coprosma hirtella	1.79	-	-	-	-	-	-	-	-	-	-
Coprosma quadrifida	18.69	-	-	-	-	-	-	-	-	-	-
Galium binifolium	2.68	-	-	-	-	-	-	-	-	-	-
Galium gaudichaudii	2.13	-	-	-	-	-	-	-	-	-	-
Galium liratum	0.24	-	-	-	-	-	-	-	-	-	-
Galium migrans	0.24	-	-	-	-	-	-	-	-	-	-
Galium propinquum	8.16	-	-	-	-	-	-	-	-	-	-
Leptostigma reptans	0.62	-	-	-	-	-	-	-	-	-	-
Morinda jasminoides	3.41	-	-	-	-	-	-	-	-	-	-
Opercularia aspera	12.22	-	-	-	-	-	-	-	-	-	-
Opercularia diphylla	0.55	-	-	-	-	+	-	-	S	-	-
Opercularia hispida	1.00	-	-	-	-	-	-	-	-	-	-
Opercularia varia	3.34	-	-	-	-	-	-	-	-	-	-
Pomax umbellata	5.57	-	-	-	-	-	-	-	-	-	-
Psychotria loniceroides	1.24	-	-	-	-	-	-	-	S	-	-
Rutaceae											
Acronychia oblongifolia	0.28	-	-	-	-	-	-	-	-	-	-
Asterolasia asteriscophora	0.03	-	-	+	-	-	-	-	-	-	-
Boronia algida	0.38	-	-	-	-	-	-	-	-	-	-
Boronia anemonifolia var. *anemonifolia*	0.21	-	-	-	-	-	-	-	-	-	-
Boronia anethifolia	0.07	-	-	-	-	+	-	-	S	-	-
Boronia deanei	0.03	-	+	-	-	-	-	-	S	+	-
Boronia ledifolia	0.10	-	-	-	-	-	-	-	LS	-	-
Boronia muelleri	0.55	-	-	-	-	-	-	-	-	-	-
Boronia nana var. *hyssopifolia*	0.14	-	-	-	-	+	-	-	-	-	-
Boronia parviflora	0.21	-	-	-	-	-	-	-	-	-	-
Boronia polygalifolia	0	-	-	-	-	+	-	-	-	-	-
Boronia rigens	0	-	-	-	-	+	-	-	S	-	-
Correa alba var. *alba*	0.10	-	-	-	-	-	-	-	-	-	-
Correa baeuerlenii	0.21	-	+	-	-	-	-	-	S	+	-
Correa lawrenciana var. *cordifolia*	1.55	-	-	-	-	-	-	-	-	-	-
Correa lawrenciana var. *latrobeana*	0	-	-	-	-	+	-	-	-	-	-
Correa lawrenciana var. *lawrenciana*	0	-	-	-	-	+	-	-	N	-	-
Correa reflexa var. *reflexa*	14.87	-	-	-	-	-	-	-	-	-	-
Correa reflexa var. *speciosa*	0	-	-	-	-	-	-	-	-	-	-
Crowea exalata	0.31	-	-	-	-	-	-	-	-	-	-
Eriostemon myoporoides subsp. *myoporoides*	0.21	-	-	-	-	+	-	-	-	-	-
Eriostemon trachyphyllus	1.14	-	-	-	-	-	-	-	-	-	-
Eriostemon virgatus	0.07	-	-	-	-	+	-	-	N	-	-
Phebalium carruthersii	0	-	-	+	-	-	-	-	S	-	-
Phebalium diosmeum	0.38	-	-	-	-	-	-	-	S	-	-
Phebalium ellipticum	0	-	-	+	-	-	-	-	-	-	-
Phebalium phylicifolium	0.17	-	-	-	-	+	-	-	-	-	-
Phebalium ralstonii	0.55	+	+	-	-	-	-	-	-	-	-
Phebalium rhytidophyllum	0	+	+	-	-	-	-	-	-	-	-
Phebalium squameum subsp. *squameum*	0.03	-	-	-	-	+	-	-	-	-	-
Phebalium squamulosum subsp. *argenteum*	0	-	-	-	-	+	-	-	-	-	-
Phebalium squamulosum subsp. *ozothamnoides*	0	-	-	-	-	+	-	-	-	-	-

Appendix 1 cont.	Freq. (%)	1	2	3	4	5	5X	6	7	8	9
Rutaceae cont.											
Phebalium squamulosum subsp. *squamulosum*	0.07	-	-	-	-	+	-	-	-	-	-
Philotheca salsolifolia	0	-	-	-	-	+	-	-	S	-	-
Sarcomelicope simplicifolia subsp. *simplicifolia*	0	-	-	-	-	+	-	-	S	-	-
Zieria arborescens subsp A.	0.03	-	-	-	-	+	-	-	-	-	-
Zieria cytisoides	0.14	-	-	-	-	-	-	-	-	-	-
Zieria fraseri subsp. B (*compacta* ms)	0	-	-	-	-	+	-	-	S	-	-
Zieria pilosa	0	-	-	-	-	+	-	-	S	+	-
Zieria smithii subsp. A	2.17	-	-	-	-	-	-	-	-	-	-
Zieria sp. D (*citriodora* ms)	0	-	+	-	-	-	-	-	N	+	-
Zieria sp. G (*buxijugum* ms)	0	+	+	-	-	-	-	-	-	-	-
Zieria sp. H (*formosa* ms)	0.03	+	+	-	-	-	-	-	-	-	-
Zieria sp. I (*parrisiae* ms)	0	+	+	-	-	-	-	-	-	-	-
Zieria sp. O (*littoralis* ms)	0.24	-	-	+	-	-	-	-	N	+	-
Sambucaceae											
Sambucus australasica	0.69	-	-	-	-	-	-	-	-	-	-
Sambucus gaudichaudiana	0.62	-	-	-	-	-	-	-	-	-	-
Santalaceae											
Choretrum candollei	0.96	-	-	-	-	-	-	-	S	-	-
Choretrum pauciflorum	0.76	-	-	-	-	-	-	-	-	-	-
Exocarpos cupressiformis	3.96	-	-	-	-	-	-	-	-	-	-
Exocarpos strictus	14.28	-	-	-	-	-	-	-	-	-	-
Leptomeria acida	0.76	-	-	-	-	-	-	-	-	-	-
Leptomeria drupacea	0.03	-	-	-	-	-	-	-	-	-	-
Omphacomeria acerba	0.58	-	-	-	-	-	-	-	-	-	-
Santalum obtusifolium	0.38	-	-	-	-	+	-	-	-	-	-
Thesium australe	0	-	+	-	-	-	-	+	-	-	-
Sapindaceae											
Alectryon subcinereus	0.65	-	-	-	-	-	-	-	-	-	-
Dodonaea multijuga	0	-	-	-	-	+	-	-	S	+	-
Dodonaea procumbens	0	-	+	-	-	-	-	-	-	+	-
Dodonaea rhombifolia	0.03	-	-	+	-	-	-	-	-	-	-
Dodonaea triangularis	0	-	-	-	-	+	-	-	S	+	-
Dodonaea triquetra	3.06	-	-	-	-	-	-	-	-	-	-
Dodonaea truncatiales	0.34	-	-	-	-	-	-	-	-	-	-
Dodonaea viscosa subsp. *angustifolia*	1.45	-	-	-	-	-	-	-	-	-	-
Dodonaea viscosa subsp. *spatulata*	0.21	-	-	-	-	-	-	-	-	-	-
Scrophulariaceae											
Derwentia derwentiana subsp. *derwentiana*	0.48	-	-	-	-	-	-	-	-	-	-
Derwentia perfoliata	0.72	-	-	-	-	-	-	-	-	-	-
Euphrasia collina subsp. *collina*	0.07	-	-	-	-	+	-	-	N	-	-
Glossostigma elatinoides	0.03	-	-	-	-	+	-	-	-	-	-
Gratiola pedunculata	0.03	-	-	-	-	-	-	-	-	-	-
Gratiola peruviana	1.58	-	-	-	-	-	-	-	-	-	-
Limosella australis	0	-	-	-	-	+	-	-	-	-	-
Mazus pumilio	0.10	-	-	-	-	+	-	-	-	-	-
Mimulus repens	0.03	-	-	-	-	+	-	-	-	-	-
Veronica calycina	14.90	-	-	-	-	-	-	-	-	-	-
Veronica gracilis	0.41	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Scrophulariaceae cont.											
Veronica notabilis	1.89	-	-	-	-	-	-	-	-	-	-
Veronica plebeia	3.68	-	-	-	-	-	-	-	-	-	-
Veronica subtilis	0	-	-	-	-	+	-	-	-	-	-
Solanaceae											
Solanum americanum	0.72	-	-	-	-	-	-	-	-	-	-
Solanum aviculare	0.10	-	-	-	-	-	-	-	-	-	-
Solanum brownii	0.14	-	-	-	-	+	-	-	-	-	-
Solanum cinereum	0.03	-	-	-	-	+	-	-	-	-	-
Solanum linearifolium	0	-	-	-	-	+	-	-	-	-	-
Solanum prinophyllum	2.82	-	-	-	-	-	-	-	-	-	-
Solanum pungetium	4.75	-	-	-	-	-	-	-	-	-	-
Solanum stelligerum	0.10	-	-	-	-	+	-	-	S	-	-
Solanum vescum	0.34	-	-	-	-	-	-	-	-	-	-
Stackhousiaceae											
Stackhousia monogyna	2.82	-	-	-	-	-	-	-	-	-	-
Stackhousia spathulata	0.03	-	-	-	-	+	-	-	-	-	-
Stackhousia viminea	0.58	-	-	-	-	-	-	-	-	-	-
Sterculiaceae											
Brachychiton populneus subsp. *populneus*	1.41	-	-	-	-	-	-	-	-	-	-
Commersonia fraseri	1.10	-	-	-	-	-	-	-	-	-	-
Lasiopetalum ferrugineum var. *cordatum*	0.10	-	-	-	-	-	-	-	S	-	-
Lasiopetalum ferrugineum var. *ferrugineum*	0.34	-	-	-	-	-	-	-	-	-	-
Lasiopetalum macrophyllum	0.48	-	-	-	-	-	-	-	-	-	-
Lasiopetalum parvifolium	0	-	-	+	-	-	-	-	S	-	-
Rulingia dasyphylla	0.03	-	-	-	-	+	-	-	-	-	-
Rulingia hermannifolia	0	-	-	+	-	-	-	-	S	+	-
Stylidiaceae											
Stylidium graminifolium	12.39	-	-	-	-	-	-	-	-	-	-
Symplocaceae											
Symplocos thwaitesii	0	-	-	-	-	+	-	-	LS	-	-
Thymelaeaceae											
Pimelea axiflora subsp. *axiflora*	9.57	-	-	-	-	-	-	-	-	-	-
Pimelea curviflora var. *acuta*	0	-	-	-	-	+	-	-	S	-	-
Pimelea curviflora var. *gracilis*	0	-	-	-	-	+	-	+	-	-	-
Pimelea curviflora var. *sericea*	0.31	-	-	-	-	-	-	+	-	-	-
Pimelea glauca	0.03	-	-	-	-	+	-	-	-	-	-
Pimelea humilis	0.07	-	-	-	-	+	-	-	-	+	-
Pimelea ligustrina subsp. *ligustrina*	2.10	-	-	-	-	-	-	-	-	-	-
Pimelea linifolia subsp. *caesia*	0	-	-	-	-	+	-	-	-	-	-
Pimelea linifolia subsp. *collina*	0.17	-	-	-	-	-	-	-	S	-	-
Pimelea linifolia subsp. *linifolia*	3.79	-	-	-	-	-	-	-	-	-	-
Wikstroemia indica	0	-	-	-	-	+	-	-	S	+	-
Tremandraceae											
Tetratheca bauerifolia	1.24	-	-	-	-	-	-	-	-	-	-
Tetratheca labillardierei	0.10	-	-	-	-	-	-	-	-	-	-
Tetratheca pilosa subsp. *latifolia*	2.20	-	-	-	-	-	-	-	-	-	-
Tetratheca subaphylla	0.21	-	-	+	-	-	-	-	-	-	-
Tetratheca thymifolia	6.85	-	-	-	-	-	-	-	S	-	-
Ulmaceae											
Trema aspera	0.58	-	-	-	-	-	-	-	-	-	-

Appendix 1 cont.	**Freq. (%)**	**1**	**2**	**3**	**4**	**5**	**5X**	**6**	**7**	**8**	**9**
Urticaceae											
Australina pusilla	1.27	-	-	-	-	-	-	-	-	-	-
Dendrocnide excelsa	0.14	-	-	-	-	-	-	-	S	-	-
Parietaria debilis	0.21	-	-	-	-	-	-	-	-	-	-
Urtica incisa	4.85	-	-	-	-	-	-	-	-	-	-
Violaceae											
Hybanthus monopetalus	0.10	-	-	-	-	+	-	-	-	-	-
Hybanthus vernonii subsp. *vernonii*	0.07	-	-	-	-	+	-	-	-	-	-
Hymenanthera dentatum	4.85	-	-	-	-	-	-	-	-	-	-
Viola betonicifolia	5.57	-	-	-	-	-	-	-	-	-	-
Viola caleyana	0.03	-	-	-	-	+	-	-	-	-	-
Viola cleistogamoides	0	-	+	-	-	+	-	-	N	-	-
Viola hederacea	38.23	-	-	-	-	-	-	-	-	-	-
Viola sieberiana	0.10	-	-	-	-	-	-	-	-	-	-
Viscaceae											
Korthalsella rubra subsp. *rubra*	0	-	-	-	-	+	-	-	-	-	-
Notothixos subaureus	0.03	-	-	-	-	+	-	-	-	-	-
Vitaceae											
Cissus antarctica	0.03	-	-	-	-	+	-	-	S	-	-
Cissus hypoglauca	3.99	-	-	-	-	-	-	-	-	-	-
Winteraceae											
Tasmannia lanceolata	3.10	-	-	-	-	-	-	-	-	-	-

Appendix 2: Unconfirmed vascular plant taxa in or near the Eden region.

FILICOPSIDA	
Blechnaceae	
Blechnum chambersii	Unconfirmed record in Eden region
Dennstaedtiaceae	
Hypolepis amaurorachis	Unconfirmed record in Eden region
Marsileaceae	
Marsilea drummondii	Confirmed record nearby Eden region
LYCOPSIDA	
Lycopodiaceae	
Huperzia australiana	Unconfirmed record in Eden region
Lycopodiella serpentina	Unconfirmed record in Eden region
MAGNOLIOPSIDA (LILIIDAE)	
Convallariaceae	
Polygonatum multiflorum	Unconfirmed record in Eden region. Introduced
Cyperaceae	
Baumea arthrophylla	Unconfirmed record in Eden region
Bolboschoenus caldwellii	Confirmed record nearby Eden region
Bulbostylis barbata	Unconfirmed record in Eden region
Chorizandra sphaerocephala	Unconfirmed record in Eden region
Cyperus laevis	Unconfirmed record in Eden region
Eleocharis pusilla	Confirmed record nearby Eden region
Gahnia trifida	Unconfirmed record in Eden region
Lepidosperma canescens	Unconfirmed record in Eden region
Lipocarpha microcephala	Unconfirmed record in Eden region
Uncinia sp. aff. *flaccida*	Taxonomic status uncertain
Iridaceae	
Patersonia occidentalis	Unconfirmed record in Eden region & confirmed record nearby Eden region
Juncaceae	
Juncus brevibracteus	Unconfirmed record in Eden region
Juncus caespiticius	Unconfirmed record in Eden region
Juncus remotiflorus	Unconfirmed record in Eden region
Juncus thompsonianus	Unconfirmed record in Eden region
Lomandraceae	
Lomandra micrantha subsp. *tuberculata*	Unconfirmed record in Eden region
Orchidaceae	
Caladenia tentaculata	Unconfirmed record in Eden region
Corybas pruinosus	Unconfirmed record in Eden region
Diuris brevissima	Unconfirmed record in Eden region
Diuris semilunulata	Confirmed record nearby Eden region
Prasophyllum frenchii	Unconfirmed record in Eden region
Prasophyllum gracile	Taxonomic status uncertain
Prasophyllum odoratum s. lat.	Taxonomic status uncertain & unconfirmed record in Eden region
Prasophyllum rogersii	Unconfirmed record in Eden region
Prasophyllum rostratum	Unconfirmed record in Eden region
Prasophyllum striatum	Unconfirmed record in Eden region
Pterostylis acuminata	Unconfirmed record in Eden region
Pterostylis aestiva	Unconfirmed record in Eden region
Pterostylis coccina	Unconfirmed record in Eden region
Pterostylis grandiflora	Unconfirmed record in Eden region

Orchidaceae cont.	
Pterostylis longipetala	Unconfirmed record in Eden region
Pterostylis sp. aff. *rufa*	Unconfirmed record in Eden region
Thelymitra aristata	Unconfirmed record in Eden region & confirmed record nearby Eden region
Thelymitra chasmogama	Unconfirmed record in Eden region & taxonomic status uncertain
Poaceae	
Austrostipa ?nitida	Unconfirmed record in Eden region
Notodanthonia linkii var. *linkii*	Confirmed record nearby Eden region
Notodanthonia nudiflora	Unconfirmed record in Eden region
Notodanthonia procera	Unconfirmed record in Eden region
Deyeuxia rodwayi	Unconfirmed record in Eden region
Deyeuxia sp. D (aff. *parviseta*)	Unconfirmed record in Eden region
Eragrostis brownii	Unconfirmed record in Eden region
Hierochloe redolens	Confirmed record nearby Eden region
Paspalidium criniforme	Unconfirmed record in Eden region
Paspalidium radiatum	Unconfirmed record in Eden region
Poa petrophila	Unconfirmed record in Eden region
Puccinellia stricta	Confirmed record nearby Eden region
Polygonaceae	
Muehlenbeckia axillaris	Confirmed record nearby Eden region
Restionaceae	
Lepidobolis drapetioides	Unconfirmed record in Eden region
Leptocarpus brownii	Unconfirmed record in Eden region
MAGNOLIOPSIDA (MAGNOLIIDAE)	
Aizoaceae	
Tetragonia implexicoma	Confirmed record nearby Eden region
Apiaceae	
Hydrocotyle hirta	Taxonomic status uncertain
Hydrocotyle pterocarpa	Taxonomic status uncertain
Hydrocotyle rivularis	Taxonomic status uncertain
Hydrocotyle sibthorpoides	Taxonomic status uncertain
Trachymene incisa subsp. *incisa*	Unconfirmed record in Eden region
Trachymene procumbens	Unconfirmed record in Eden region
Araliaceae	
Astrotricha sp. B	Taxonomic status uncertain
Asteraceae	
Centipeda cunninghamii	Confirmed record nearby Eden region
Craspedia coolaminica	Confirmed record nearby Eden region
Gnaphalium spicatum	Taxonomic status uncertain
Leptorhynchos linearis	Taxonomic status uncertain
Picris burbidgei	Confirmed record nearby Eden region
Podolepis robusta	Unconfirmed record in Eden region
Senecio gunnii	Unconfirmed record in Eden region
Senecio lautus subsp. *lautus*	Uncertain identification
Senecio vagus	Unconfirmed record in Eden region
Solenogyne bellioides	Unconfirmed record in Eden region
Brassicaceae	
Cardamine tenuifolia	Confirmed record nearby Eden region
Campanulaceae	
Wahlenbergia gracilenta	Unconfirmed record in Eden region

Caryophyllaceae	
Spergularia augustifolia	Taxonomic status uncertain
Stellaria filiformis	Unconfirmed record in Eden region
Chenopodiaceae	
Sarcocornia blackiana	Unconfirmed record in Eden region
Scleranthus singuliflorus	Unconfirmed record in Eden region
Dilleniaceae	
Hibbertia monogyna	Unconfirmed record in Eden region
Hibbertia scandens	Unconfirmed record in Eden region
Elaeocarpaceae	
Elaeocarpus kirtonii	Unconfirmed record in Eden region
Epacridaceae	
Epacris calvertiana var. *calvertiana*	Confirmed record nearby Eden region
Fabaceae (Faboideae)	
Daviesia genistifolia	Unconfirmed record in Eden region
Daviesia squarrosa	Unconfirmed record in Eden region
Dillwynia floribunda var. *floribunda*	Unconfirmed record in Eden region
Dillwynia retorta species complex	Unconfirmed record in Eden region
Phyllota phylicoides	Unconfirmed record in Eden region
Pultenaea amoena	Taxonomic status uncertain
Pultenaea ferruginea var. *ferruginea*	Unconfirmed record in Eden region
Pultenaea flexilis	Unconfirmed record in Eden region
Pultenaea planifolia	Taxonomic status uncertain
Pultenaea procumbens	Confirmed record nearby Eden region
Swainsona galegifolia	Confirmed record nearby Eden region
Swainsona monticola	Confirmed record nearby Eden region
Fabaceae (Mimosoideae)	
Acacia buxifolia subsp. *buxifolia*	Confirmed record nearby Eden region
Gentianaceae	
Gentiana baeuerlenii	Confirmed record nearby Eden region
Geraniaceae	
Geranium obtusisepalum	Unconfirmed record in Eden region
Geraniaceae	
Geranium potentilloides var. *abditum*	Confirmed record nearby Eden region
Goodeniaceae	
Brunonia australis	Unconfirmed record in Eden region
Haloragaceae	
Myriophyllum verrucosum	Confirmed record nearby Eden region
Lamiaceae	
Prostanthera porcata	Confirmed record nearby Eden region
Loganiaceae	
Mitrasacme paludosa	Possible misidentification
Loranthaceae	
Muellerina celastroides	Unconfirmed record in Eden region
Myoporaceae	
Myoporum floribundum	Unconfirmed record in Eden region
Myrtaceae	
Callistemon salignus	Unconfirmed record in Eden region
Eucalyptus delegatensis	Confirmed record nearby Eden region
Eucalyptus dixsonii	Taxonomic status uncertain
Eucalyptus permixta	Taxonomic status uncertain

Myrtaceae cont.	
Eucalyptus bosistoana × *poylanthemos* subsp. *vestita* hybrid OR *E. poyanthemos* subsp. *longior*	Possible misidentification
Eucalyptus rossii	Confirmed record nearby Eden region
Kunzea capitata	Possible misidentification
Leptospermum glabrescens	Unconfirmed record in Eden region
Leptospermum parvifolium	Possible misidentification
Leptospermum squarrosum	Uncertain identification
Onagraceae	
Epilobium hirtigerum	Unconfirmed record in Eden region
Pittosporaceae	
Rhytidosporum inconspicuum	Taxonomic status uncertain
Polygonaceae	
Persicaria strigosa	Unconfirmed record in Eden region
Proteaceae	
Hakea salicifolia	Unconfirmed record in Eden region
Persoonia mollis subsp. *caleyi*	Confirmed record nearby Eden region
Symphionema palustris	Taxonomic status uncertain
Rhamnaceae	
Cryptandra spinescens	Unconfirmed record in Eden region
Pomaderris aurea	Unconfirmed record in Eden region
Pomaderris velutina	Unconfirmed record in Eden region
Rubiaceae	
Galium australe	Unconfirmed record in Eden region
Galium ciliare	Unconfirmed record in Eden region
Nertera granadensis	Unconfirmed record in Eden region
Rutaceae	
Eriostemon australasius subsp. *australasius*	Unconfirmed record in Eden region
Scrophulariaceae	
Gratiola pubescens	Unconfirmed record in Eden region
Solanaceae	
Solanum laciniatum	Unconfirmed record in Eden region
Solanum triflorum	Confirmed record nearby Eden region
Stackhousiaceae	
Stackhousia nuda	Unconfirmed record in Eden region
Sterculiaceae	
Rulingia rugosa	Unconfirmed record in Eden region
Tremandraceae	
Tetratheca ericifolia	Unconfirmed record in Eden region
Urticaceae	
Australina muelleri	Taxonomic status uncertain
Rostranthus suaveolens	Taxonomic status uncertain

Appendix 3: Introduced vascular plant taxa of the Eden region. Frequency is the percentage of 2906 floristic samples in which respective taxa were recorded. + indicates herbarium specimen held at NSW, ANBG or MEL.

	Frequency (%)	Herbarium specimen
CONIFEROPSIDA		
Pinaceae		
Pinus nigra var. *maritima*	0	
Pinus pinaster	0	
Pinus radiata	0.34	
MAGNOLIOPSIDA (LILIIDAE)		
Agavaceae		
Agave americana	0	
Alismataceae		
Sagittaria graminea	0	+
Alliaceae		
Agapanthus africanus	0	
Alstroemeriaceae		
Alstroemeria pulchella	0.03	
Araceae		
Zantedeschia aethiopica	0	
Asparagaceae		
Asparagus officinalis	0	
Myrsiphyllum asparagoides	0.10	+
Protoaparagus aethiopicus	0	
Commelinaceae		
Tradescantia albiflora	0.34	
Cyperaceae		
Cyperus congestus	0.10	+
Cyperus eragrostis	0.03	+
Eleocharis minuta	0	
Isolepis marginata	0.03	+
Isolepis prolifera	0.03	+
Isolepis sepulcralis	0	
Iridaceae		
Crocosmia × *crocosmiiflora*	0	
Gladiolus gueinzii	0.03	
Romulea rosea var australis	0	+
Sisyrinchium iridifolium	0	
Sisyrinchium sp. A	0	
Tritonia lineata	0	+
Watsonia meriana	0.03	
Juncaceae		
Juncus acutiflorus	0	+
Juncus articulatus	0.10	+
Juncus bufonius	0.07	+
Juncus bulbosus	0.03	+
Juncus cognatus	0	+
Juncus flavidus	0	+
Juncus microcephalus	0	+

Appendix 3 cont.	**Frequency (%)**	**Herbarium specimen**
Liliaceae		
Lilium formosanum	0	
Poaceae		
Agrostis capillaris	0	
Agrostis stolonifera	0	+
Aira caryophyllea	0.31	+
Aira elegans	0	
Aira elegantissima	0.10	
Aira praecox	0	
Ammophila arenaria	0.55	+
Andropogon virginicus	0	
Anthoxanthum odoratum	0.03	+
Avena fatua	0	
Axonopis affinis	0	
Briza maxima	0.17	
Briza minor	0.10	
Bromus catharticus	0.07	+
Bromus diandrus	0	
Bromus hordeaceus	0.14	+
Bromus tectorum	0	+
Cenchrus longispinus	0	+
Chloris gayana	0.03	+
Cortaderia selloana	0	
Cynodon dactylon	0.48	+
Cynosurus cristatus	0	+
Cynosurus echinatus	0	
Dactylis glomerata	0.17	+
Digitaria sanguinalis	0	
Digitaria velutina	0.03	+
Echinochloa crus-galli	0	
Ehrharta calycina	0	+
Ehrharta erecta	0	+
Ehrharta longiflora	0	
Eleusine indica	0	
Eleusine tristachya	0	
Festuca elatior	0	+
Festuca nigrescens	0	+
Festuca pratensis	0	+
Festuca rubra subsp. *rubra*	0	+
Glyceria declinata	0	+
Holcus lanatus	0.86	+
Hordeum glaucum	0	+
Hordeum marinum	0	+
Lagurus ovatus	0.03	
Lolium perenne	0.21	
Nassella neesiana	0.03	
Nassella trichotoma	0	+
Panicum capillare var. *capillare*	0	
Panicum gilvum	0	
Paspalum dilatatum	1.07	
Paspalum urvillei	0.03	
Pennisetum clandestinum	0.58	+
Pennisetum villosum	0	

Appendix 3 cont.	**Frequency (%)**	**Herbarium specimen**
Poaceae cont.		
Pentaschistis airoides	0	+
Phalaris aquatica	0.07	
Phalaris paradoxa	0	
Phleum pratense	0	+
Phyllostachys aurea	0	
Poa annua	0.07	+
Poa bulbosa	0	+
Poa pratensis	0.07	+
Polypogon monspeliensis	0.03	
Rostraria cristata	0.45	
Sclerochloa dura	0	+
Setaria gracilis	0.31	
Sporobolus indicus var. *capensis*	0.93	+
Stenotaphrum secundatum	0.17	
Vulpia bromoides	0.03	+
Vulpia megalura	0	
Vulpia myuros	0.07	
MAGNOLIOPSIDA/MAGNOLIIDAE		
Aceraceae		
Acer negundo	0	
Aizoaceae		
Aptenia cordifolia	0	+
Carpobrotus aequilaterus	0.03	
Carpobrotus edulis	0.03	
Tetragonia nigrescens	0.07	
Amaranthaceae		
Alternanthera pungens	0	
Amygdalaceae		
Prunus cerasifera	0.03	
Prunus laurocerasus	0	
Prunus persica	0	
Anacardiaceae		
Schinus molle var. *areira*	0.03	
Apiaceae		
Berula erecta	0	
Ciclospermum leptophyllum	0	
Conium maculatum	0.14	+
Daucus carota	0	
Foeniculum vulgare	0	
Hydrocotyle bonariensis	0	
Apocynaceae		
Vinca major	0.14	
Araliaceae		
Hedera helix	0	
Asclepiadaceae		
Araujia sericiflora	0.17	+
Gomphocarpus fruiticosus	0	
Tweedia coerulea	0.03	

Appendix 3 cont.	**Frequency (%)**	**Herbarium specimen**
Asteraceae		
Ageratina adenophora	0	
Arctotheca calendula	0	
Arctotheca populifolia	0.28	
Artemisia verlotiorum	0	+
Aster subulatus	0.34	
Bidens pilosa	0.48	+
Bidens tripartita	0	
Carduus pycnocephalus	0	
Carduus tenuiflorus	0	
Chrysanthemoides monilifera subsp. *rotundata*	0.03	
Cichorium intybus	0	+
Cirsium vulgare	5.78	+
Conyza albida	4.58	
Conyza bonariensis	0.21	+
Conyza canadensis var. *canadensis*	0	+
Cotula coronopifolia	0.24	+
Crassocephalum crepidioides	0	
Crepis capillaris	0.03	
Delairea odorata	0.10	+
Dimorphotheca pluvialis	0.03	
Dittrichia graveolens	0	+
Facelis retusa	0.07	
Galinsoga parviflora	0	
Gazania rigens	0	
Gnaphalium americanum	0.07	
Gnaphalium calviceps	0.07	
Gnaphalium coarctatum	0.38	+
Gnaphalium pensylvanicum	0	
Helminthotheca echioides	0	+
Hypochoeris glabra	0.28	
Hypochoeris radicata	20.82	+
Lactuca serriola	0	
Leontodon taraxacoides subsp. *taraxacoides*	0	
Onopordum acanthium subsp. *acanthium*	0	
Roldana petasitis	0	
Senecio elegans	0	
Senecio jacobaea	0	
Senecio madagascariensis	0.24	
Senecio vulgaris	0.03	
Silybum marianum	0.03	
Sonchus asper subsp. *glaucescens*	0	+
Sonchus oleraceus	2.41	
Tagetes minuta	0.14	+
Taraxicum officinale	0.03	+
Tolpis umbellata	0.14	
Vellereophyton dealbatum	0	+
Basellaceae		
Anredera cordifolia	0	
Boraginaceae		
Echium plantagineum	0	
Echium vulgare	0.03	+
Myosotis caespitosa	0	+
Myosotis discolor	0	+

Appendix 3 cont.	**Frequency (%)**	**Herbarium specimen**
Brassicaceae		
Cakile edentula	1.41	
Cakile maritima	0	+
Capsella bursa-pastoris	0	
Erophila verna	0.03	
Hirschfeldia incana	0.07	
Lepidium africanum	0.10	
Lepidium virginicum	0.14	
Rorippa nasturtium-aquaticum	0	+
Rorippa palustris	0	+
Sisymbrium officinale	0	
Sisymbrium orientale	0	
Buddlejaceae		
Buddleja davidii	0	
Cactaceae		
Opuntia aurantiaca	0	
Opuntia stricta	0	
Callitrichaceae		
Callitriche stagnalis	0.07	
Cannabaceae		
Cannabis sativa	0.03	
Caprifoliaceae		
Lonicera japonica	0.07	
Caryophyllaceae		
Arenaria leptoclados	0	+
Cerastium fontanum subsp. *vulgare*	0	
Cerastium glomeratum	1.00	+
Moenchia erecta	0.03	
Paronychia brasiliana	0.31	
Petrorhagia nanteulii	0.03	
Polycarpon tetraphyllum	0.45	
Sagina apetala	0	+
Sagina procumbens	0	
Saponaria officinalis	0	
Silene gallica	0.55	+
Spergula arvensis	0	
Spergularia marina	0	
Spergularia rubra	0.03	
Stellaria media	0.28	
Chenopodiaceae		
Atriplex patula	0	+
Atriplex prostrata	0.03	+
Chenopodium album	0	
Chenopodium ambrosioides	0	
Chenopodium detestans	0	+
Chenopodium murale	0	+
Chenopodium vulvaria	0	+
Clusiaceae		
Hypericum perforatum	0.03	

Appendix 3 cont.	**Frequency (%)**	**Herbarium specimen**
Crassulaceae		
Crassula multicava	0	+
Convolvulaceae		
Convolvulus arvensis	0	+
Cuscuta campestris	0	+
Ericaceae		
Erica lusitanica	0	
Euphorbiaceae		
Euphorbia helioscopia	0	+
Euphorbia lathyrus	0.03	+
Euphorbia paralius	0	+
Euphorbia peplus	0.21	+
Fabaceae (Caesalpinioideae)		
Gleditsia triacanthos	0	+
Senna pendula var. *glabrata*	0	+
Senna septemtrionalis	0	+
Senna × floribunda	0	+
Fabaceae (Faboideae)		
Astragalus hamosus	0	+
Coronilla varia	0.07	
Cytisus scoparius	0	+
Dipogon lignosus	0	+
Genista linifolia	0	
Genista monspessulana	0	
Lotus corniculatus	0.03	+
Lotus suaveolens	0	+
Lotus uliginosus	0	+
Medicago arabica	0	
Psoralea pinnata	0	+
Robinia pseudoacacia	0	+
Trifolium arvense	0.21	
Trifolium campestre	0.14	
Trifolium dubium	0.45	+
Trifolium fragiferum	0	+
Trifolium glomeratum	0.03	
Trifolium pratense	0.03	
Trifolium repens	1.07	+
Trifolium striatum	0.03	
Trifolium subterraneum	0.03	
Ulex europaeus	0	
Vicia hirsuta	0	
Vicia sativa subsp. *angustifolia*	0	+
Vicia tetrasperma	0.03	
Vicia villosa	0	
Fabaceae (Mimosoideae)		
Acacia baileyana	0.03	
Acacia baileyana × decurrens	0	+
Acacia decurrens	0	+
Acacia podalyriifolia	0	
Acacia pravissima	0	+
Acacia saligna	0	
Acacia vestita	0	
Paraserianthes lophantha subsp. *lophantha*	0	+

Appendix 3 cont.	**Frequency (%)**	**Herbarium specimen**
Fumariaceae		
Fumaria bastardii	0	
Fumaria officinalis	0.03	
Gentianaceae		
Centaurium erythraea	3.82	+
Centaurium pulchella	0	+
Centaurium tenuiflorum	0.03	+
Geraniaceae		
Erodium cicutarium	0	
Geranium molle subsp. *molle*	0	
Hydrangeaceae		
Hydrangea macrophylla	0	
Lamiaceae		
Leonotis leonurus	0	+
Mentha pulegium	0.07	
Mentha × *piperita*	0	+
Mentha × *spicata*	0	+
Mentha × *piperita* nothomorph *citrata*	0	
Prunella vulgaris	1.93	+
Salvia verbenaca	0.03	
Stachys arvensis	0	+
Linaceae		
Linum trigynum	0	
Lythraceae		
Cuphea aff. *hyssopifolia*	0	+
Malaceae		
Cotoneaster franchetii	0.07	
Cotoneaster glaucophyllus	0	
Cotoneaster microphyllus	0	+
Crataegus monogyna subsp. *nordica*	0.24	
Malus × *domestica*	0	
Pyracantha angustifolia	0	
Malvaceae		
Lagunaria patersonii	0	
Malva parviflora	0	
Modiola caroliniana	0.34	
Sida rhombifolia	0.24	
Meliaceae		
Melia azedarach	0	
Moraceae		
Maclura pomifera	0	
Myrtaceae		
Leptospermum laevigatum	0.72	
Oleaceae		
Ligustrum sinense	0.10	
Ligustrum vulgare	0.03	
Olea europaea subsp africana	0	
Onagraceae		
Oenothera affinis	0	
Oenothera stricta subsp. *stricta*	0	

Oxalidaceae		
Oxalis corniculatus	0	
Oxalis pes-caprae	0	
Oxalis purpurea	0	+
Oxalis articulata	0	
Oxalis incarnata	0.03	
Papaveraceae		
Argemone ochroleuca subsp. *ochroleuca*	0	
Eschscholzia californica	0	
Papaver hybridum	0	+
Papaver somniferum subsp. *somniferum*	0	+
Passifloraceae		
Passiflora edulis	0.03	
Phytolacaceae		
Phytolacca octandra	0.48	
Pittosporaceae		
Sollya heterophylla	0	
Plantaginaceae		
Plantago coronopus	0	
Plantago lanceolata	2.27	+
Plantago major	0.10	
Polygalaceae		
Polygala myrtifolia	0	
Polygonaceae		
Acetosa sagittata	0.07	+
Acetosella vulgaris	0.48	+
Fallopia japonica	0	+
Persicaria maculosa	0.03	+
Polygonum aviculare	0.03	
Rumex conglomeratus	0	
Rumex crispus	0.10	
Primulaceae		
Anagallis arvensis	2.37	+
Ranunculaceae		
Batrachium trichophyllum	0	+
Ranunculus repens	0	
Ranunculus scleratus	0	+
Rosaceae		
Potentilla recta	0	+
Rosa rubiginosa	0.72	+
Rubus fruticosus	0.14	
Rubus laciniatus	0	+
Rubus ulmifolius	2.89	
Rubus vestitus	0	+
Rubiaceae		
Coprosma repens	0.03	
Galium aparine	0	
Galium tricornatum	0	
Sherardia arvensis	0.03	
Salicaceae		
Populus alba	0	
Populus nigra	0	
Salix alba	0.14	+

Salicaceae cont.		
Salix alba var vittelina	0	
Salix babylonica	0	
Salix cinerea	0	+
Salix fragilis	0	
Salix matsudana × alba	0	
Salix viminalis	0	+
Salix × calodendron	0	+
Salix × reichardtii	0	+
Salix × rubens	0	
Sambucaceae		
Sambucus nigra	0	
Scrophulariaceae		
Linaria arvensis	0	+
Mimulus moschatus	0	+
Orobanche minor	0	
Verbascum blattaria	0	+
Verbascum thapsus subsp. *thapsus*	0	+
Verbascum virgatum	0.21	+
Veronica anagallis-aquatica	0	+
Veronica catenata	0	+
Veronica persica	0.07	
Veronica serpyllifolia	0	
Simaroubaceae		
Ailanthus altissima	0.03	+
Solanaceae		
Cestrum parqui	0	+
Datura stramonium	0	+
Lycium barbarum	0	
Lycium ferocissimum	0.03	
Nicandra physalodes	0	
Physalis ixocarpa	0	+
Physalis peruviana	0.21	+
Solanum chenopodioides	0.34	+
Solanum mauritianum	0	
Solanum nigrum	1.24	+
Solanum pseudocapsicum	0.48	+
Urticaceae		
Urtica urens	0	
Verbenaceae		
Lantana camara var. *camara*	0	+
Verbena bonariensis	1.20	
Verbena incompta	0	+
Verbena officinalis	0	+
Verbena rigida	0.41	+
Violaceae		
Viola odorata	0.03	
Zygophyllaceae		
Tribulus terrestris	0	+

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A Guide to Natural Vegetation in the Hawkesbury–Nepean Catchment

Doug Benson, Jocelyn Howell, & Lyn McDougall

From Mountain Devils in the windswept heaths of the Upper Blue Mountains to mangroves in the estuary of the Hawkesbury River, the catchment includes a wealth of plant diversity and landform variety. This guide describes the natural vegetation of the Hawkesbury, Nepean, Grose, Capertee, Wolgan, Wollangambe, Colo and Macdonald River catchments and includes comments on landform, geology, soils and rainfall. 1500 native plant species are listed in the accompanying booklet.

68 pages A4 size, 48 colour photos plus 58 page enclosed booklet, RRP: $19.95

Published by the Royal Botanic Gardens, Sydney, 1996

CUNNINGHAMIA

A journal of plant ecology for eastern Australia

Volume 6(1):1–281 1999

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